

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

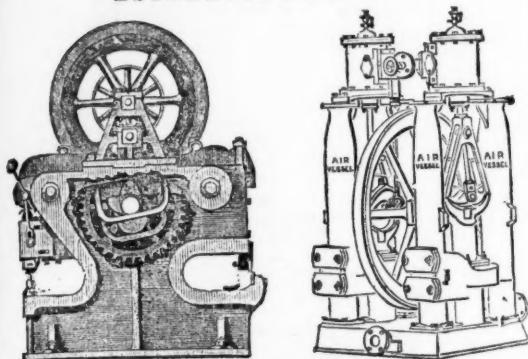
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No. 2072.—Vol. XLV.

LONDON, SATURDAY, MAY 8, 1875.

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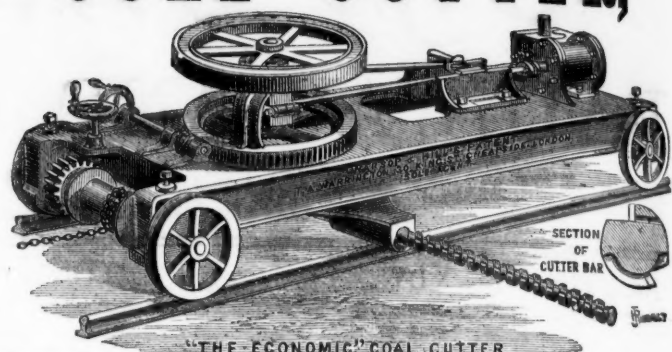
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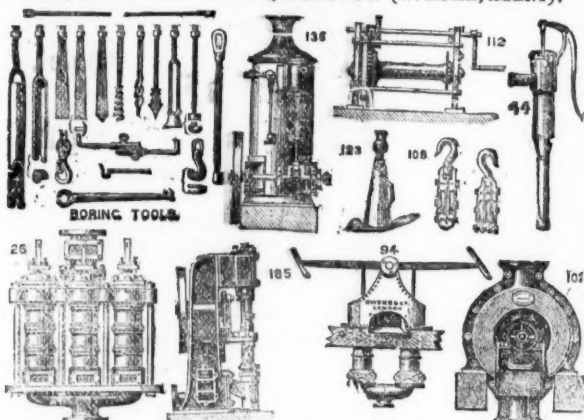
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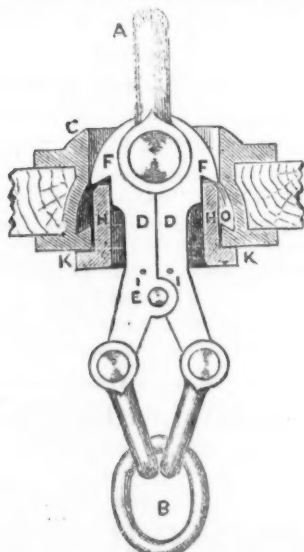
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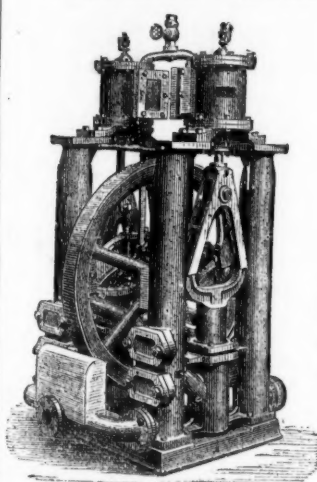
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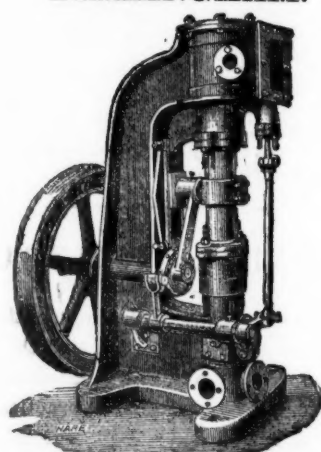


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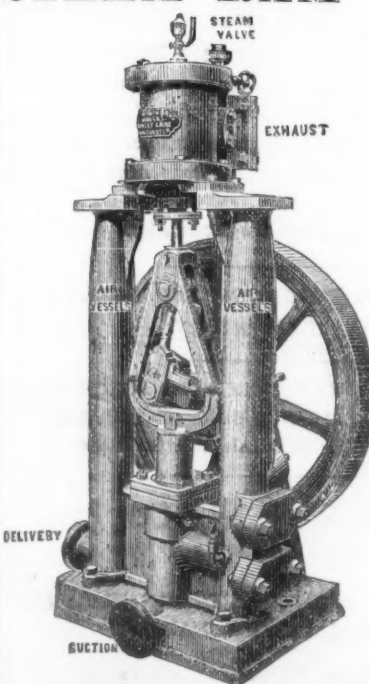
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**Mac Adam's Variable Turbine.**

This wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and, in this way, always assists it by whatever amount of power the water is capable of giving, and, therefore, saves so much fuel.  
This Turbine is applicable to all heights of fall. It works immersed in the tail-water, so that no part of the fall is lost, and the motion of the wheel is not affected by floods or back-water.  
References to places where it is at work will be given on application to the makers,—

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## Original Correspondence.

## COAL-CUTTING MACHINERY.

## THE GILLOTT AND COPLEY VERSUS THE PICK MACHINE.

Sir,—It appears by the information which I have received since I wrote you on the 27th ultimo that the Gilloft and Copley coal-cutting machine, which has been working some months at the Newmarket Colliery, at Drighlington, near Leeds, only cuts a little over 4 yards per hour, and not, as was supposed, 22. That the power actually costs 7d. per ton of coal cut, and not, as was stated, 8-12ths of a penny. I was aware that the coal measures of the Newmarket of the district presented an exceptionally favourable band of shale for the employment of a rotary machine, and so far as my experience goes, believing that the mean average of cutting work done, as claimed by Mr. Bass, could not be obtained out of a slower speed than 33 yards per hour, I assumed that he would be able to do that quantity if he could realise the before-mentioned average of 22 yards per hour, and this will account for the high speed named by me in my last letter. I know that it is a subject of great difficulty, and no two trials of any machine will come out precisely alike, and this no doubt led Mr. Bass to take as his basis the average workings of his invention; and he acted wisely, for any other plan would only have produced confusion and disappointment.

The poor results which have attended the working of his rotary machine at Newmarket may have disappointed Mr. Bass, but as he never meant to give the impression that his nominal working capacity should be taken his candour cannot be called in question. You have testified from your own personal observations, in the leading article of last week, that the pick machine is capable of cutting at the rate of 50 yards an hour; nevertheless, I only count the average working in that same seam at the small number of 7 yards per hour throughout the weekly working, and unless Mr. Bass deals with the working of his own machine on a similar principle great disappointment must inevitably ensue. As to the mere mechanical act of cutting, there is not much difficulty with the machine represented by Mr. Bass; and so long as matters run even, and plain sailing, his work is well done; indeed, I believe it to be as perfect as any machine can be constructed upon a principle which I consider to be inherently defective. The collateral circumstances of coal mining are so various and serious, and the difficulties—often not visible to the most attentive workmen—so numerous, as to present obstacles and hindrances which tell greatly upon the gross estimates of quantity when predicated from "show" experiments. Then again, it must not be expected that the behaviour of the superincumbent strata in working on a new system can be ascertained with mathematical precision, hence great practical experience is really necessary to anyone to speak in the name of authority, and I am not able to say whether Mr. Bass possesses that experience.

Many of the mining engineers of the greatest eminence and practice still ignore coal-cutting by machinery, and I do not think that half-a-dozen out of that able body of men can be found who have really attempted to master the subject, although there has not, in my judgment, ever been an improvement introduced into pit working which to the community at large or to the working men is of equal importance. As instances of inertness which prevails, and the difficulties which have had to be contended against, I may mention that the Midland Institute of Mining Engineers more than a year ago appointed a committee to consider and report upon coal-cutting by machinery, and more than ten years ago the North of England Institute of Mining and Mechanical Engineers appointed a committee for the same purpose, but up to this time neither body has received any report; and a few years ago I offered a prize of £500. for the best coal-cutting machine, but practically there was no competition, and Mr. Bass, with whom I had some correspondence on the subject at the time, would not enter his machine for competition. There were two other inventions entered, both on the rotary principle, but at the time for putting them on their trial only one was forthcoming, but it would do no work in the coal, although I have understood it subsequently achieved great distinction at an agricultural meeting in the North; since that time it has gone through many romantic and stirring adventures, and passed out of sight. The other of these two has acquired some eminence, but at the Newmarket Colliery, I understand, it did not prove satisfactory. The proprietors were induced to erect the entire plant specially for that invention, but after some weeks of effort it retired in favour of Mr. Bass's machine. Why the proprietors did not take their machine to the contest I never could make out. I recollect they explained their reasons to the committee, but the explanation did not appear to be understood; however, so it was, and neither they nor Mr. Bass showed any inclination to take advantage of the superior merits of their respective inventions over the pick machine.

From these causes the "respective merits" of the various coal-cutting inventions remain in a state of vague uncertainty, but I now hope that, through the business-like zeal and scientific interest in the question of the Editor of the *Mining Journal*, we may have it cleared up, and Mr. Bass can, I think, expedite that result if he is disposed to do so.

I shall now refer to the work done on Thursday last at Drighlington. The pit is only about 80 yards deep, and is well laid out for the working of a rotary machine. There are two working places set off within 200 yards of each other. The working faces are 36 yards in length laid on the board. Straight work roads have been driven entirely round the panels, each road being about 4 ft. 6 in. wide; the total length of face opening is about 33½ yards. The machine is stabled in a crossover road, situated about midway between the two benches, and at the end of each working day is carried to that place, and from whence it is taken each morning to its next working face. The section of the seam is good, 6 ft. from floor to roof, and the baring shale (dirt) is of a soft and kindly nature, and free from pyrites, and with the exception of the Parkgate seam of the Wharfedale Silkstone Colliery I know of none more favourable for this class of machinery.

The proprietors had given us full permission to visit the colliery on the 28th inst., the manager having ample notice of it, and at 9.30 A.M. the inspecting party had reached the working place, where the machine was found in position, with a length of 6 yards already cut. At 10 A.M. the air was turned on, and at 10.17 another length of 6 yards had been excavated, and as the cable length had been run off, and as the tackle had to be removed the arranged exhibit came to an end, showing a traverse of 1 yard in each 2½ minutes, or (say) 24 yards per hour. The work was continued in the usual manner until the bench was finished, and we are since informed that those engaged in the colliery that they finished cutting at 3 o'clock P.M. As the machine cannot work throughout a bench without about 5 yards of hand boring being done for it, we calculate that the actual work done between 7 o'clock A.M. and 3 P.M. was 33 yards, and the depth 38 in. Taking the coal out of running yard this depth, and the thickness at 4 ft., there will be 30 cwt., and as the cost of the hand cutting must be debited to the machine account—being an indispensable accessory to the Gilloft and Copley machine—I must credit it with the product of 36 yards for the shift of eight hours, or 54 tons. The machine is only in operation three days a week, so that 162 tons represents the output of coal cut by this machine per week at this colliery. I do not see why it should not work every day, and if it did so then 324 tons would constitute the full week's work, which is something less than Mr. Bass claimed for its daily product of ten hours.

Mr. Bass has some objection to my formula for ascertaining the commercial view of the case, but he used it nevertheless, and omitted to point out how he would improve it. I have no present method of amending it, but as that part of the subject must next come under review, I must deal with it as I best can, and trust I may attain to substantial accuracy. In all these cases I am assuming a hypothetical seam of 4 feet. There are—

3 men constantly attending the machine at 5s. 3d. per day	15s. 9d.
2 men road laying, 4 hours per day at 9d. per hour	6 0
2 men end cutting, 3 yards at 3s. 1d. per yard	9 3
6 men removing the machine each day, 4 hours at 8d. per hour	16 0
Total	47s. 0d.

And this is 10½d. per ton in mere cutting wages upon all the coal

got. The cost of the air, as given by Mr. Bass, is simply ridiculous—i.e., 8-12d.—and this statement of the case justifies careful examination into it. The boiler is of 40-horse power, the steam cylinder is 22 in. diameter and 4 ft. stroke. The air compressing cylinder is 20 in. diameter, working at 15 strokes per minute, at a steam pressure of 45 lbs. and the air at 35 lbs. per square inch. Everything is new and of excellent construction, and Mr. Bass has been extremely fortunate in having such admirable quarters for his operations. His coal cutter has two cylinders of 8 in. diameter and 8 in. stroke, working at 140 strokes per minute, and consumes 7800 cubic feet of air per hour, or 62,400 ft. per day of 8 hours. Thus 1155 ft. for each ton of coal, which at 6d. per 1000 (and I do not think that it is now done at the price), the cost is 7d. for every ton of coal cut.

If the cutting wages are	10½d.
And the cost of power	7
Total cost per ton	17½d.

This result does not seem very dissimilar to that of the "Monitor," putting wages and power together. As to the work done by the "Pick," I may say that there are very few places in which the Pick machine may not be worked fairly well; it is easily carried about from place to place, can hardly be broken or put out of order, and in the average of workings will do 7½ yards per hour, 3 ft. deep, or 60 yards in a day of 8 hours, in such measures as those at Newmarket Colliery.

One machine 8 hours, boring 60 yards, at 2s. 6d. per yard, is 84 tons, employing 2 men attending it at 10d. per hour	13s. 4d.
And the consumption of air at 6d. per 1000—1 1-12d.	7
And taking them together, 3d. per ton on 84 tons is 17. 1s.	20s. 11d.

The difference being 14½d. per ton in favour of the Pick.

I think I have about exhausted the question as you submitted it to me. I hope Mr. Bass will have learnt through my explanations that there is not that "enormous superiority" in his machine over the Pick, and that his good opinion of our labours may be increased; for he will perhaps bear in mind that when we entered upon the task there was no such thing as coal cutting by power in existence, and that we have had to mould and fashion many troublesome things, and some of which are far more difficult to overcome than merely cutting the strata.—Leeds, May 5.

WILLIAM FIRTH.

## TABLE OF COMPARISONS.

The Pick.	Working at Newmarket Colliery of Gilloft and Copley's Rotary, April 28.
Size—Length	4 ft. 4 in. 6 ft. 6 in.
Breadth	2 4 2 6
Height	2 2 3 2
Diameter of cutter	4 6
Length of stroke	12 in. 0 8
Diameter of cylinder	7 one cylinder 0 8 two cylinders
Area in inches	461,808 one cylinder 322,125 each cylinder
Double strokes per minute	60 140
Running yards cut per hour	7½ 4½
Cubic feet of air consumed per yard of coal	270 1155
Depth of coal cut	36 in. 38 in.
Cost per ton of coal in wages and power	3d. 17½d.
Number of men employed	2 9
Difference in favour of Pick on every ton of coal cut	14½d.

## COAL-CUTTING MACHINERY.

Sir,—I think inventors, as well as colliery proprietors, should be thankful to you for having initiated the correspondence on the capabilities of coal-cutting machinery, now going on in the *Journal*. It was a question that required ventilating, and as an advocate of the rotary system I am by no means alarmed at the result, though I feel that it might have had an advocate more able to do justice to its merits.

I am obliged to Mr. Firth for the information that he spent £3000. and a great deal of time and labour in trying to perfect a rotary machine. It shows he is fully aware that it is the right principle, but he seems to have yet to learn that it is quite possible for another to accomplish what even he has failed to do. It is not, however, to be inferred from this that I consider the Gilloft and Copley a perfect machine, neither am I so bigoted as to believe that it or any other machine is capable of being adapted to every variety of circumstances that may occur in coal mining; and I am quite ready to admit that there are special conditions under which the pick would work to greater advantage, and probably others in which the Baird machine would do better than either; still, notwithstanding this admission and Mr. Firth's last letter, I adhere to the opinion before expressed, that up to the present time it is "the best rotary machine either in this country or America," and that in its applicability to all the ordinary requirements of long-wall coal mining, and its power of producing a large quantity of coal in a given time, the rotary does possess "enormous advantages" over the pick, or any other system. Before going further allow me to clear the American Monitor out of the way. It is no part of my business to champion this machine; no doubt Mr. Alexander, when he sees the statement, will be quite able to take care of himself. There must be some error, either in Mr. Firth's mode of stating the case or in Mr. Alexander's letter, is to me very evident; it is not probable he would state his machine was geared to travel 16 yards per hour if he knew at the same time that the utmost amount of undercutting it could do was at the rate of 2½ yards per hour. It was but justice to an absent opponent to point this out.

In my former letter I confine myself closely to the points raised by Mr. Firth, when in complying with your request it suited him best to confine himself to a comparison of the quantity of coal cut in a day of 10 hours, and the cost incurred per ton for compressed air under certain given conditions; and in carrying the comparison on I had no choice but to accept them—these were a 4 ft. seam, air at 45 lbs. pressure, costing 6d. per 1000 ft., the engines cutting off at half-stroke; and, as shown by the calculations, the machines working ten consecutive hours without any hitch or stoppage. Mr. Firth does not say in either letter whether his machine does cut off at the half or three quarter stroke, or not at all, but for the sake of being like the Monitor he puts it at half; he asserts that air at 40 lbs. pressure cost 6d. per 1000 ft., and multiplies the work his machine does in an hour by ten for the day's work. I did not set this formula, Mr. Firth set it. I could but follow it, and if the working it out puts his machine at a disadvantage it is too bad to blame me, and I intimate that I have made an "unintentionally delinquent statement." In connection with this part of the subject, I observe Mr. Firth now says that his calculation includes all stoppages, together with removals from one working place to another, &c., but this he must allow me to observe does not exactly coincide with the statement in his former letter, in which he bases his calculation on the engine making 60 strokes a minute for 60 minutes the hour to undercut 7½ yards=10 tons, making it clear that his machine has to work the whole hour picking at the coal to do the 109 tons in the day, for which he takes credit. In my calculations I was careful to follow exactly the same plan, so that I do not understand how he can say "that Mr. Bass's way of stating the case differs essentially from his."

Mr. Firth's letter reminds me of the advice said to have been given to a young barrister, "If you have nothing good to say of your own client, the next best thing is to abuse the other side." He says but little about his Pick machine, but occupies a large space on throwing doubts on the correctness of my statement, and to what he calls "a catalogue of defects which he believes to be inherent in the principle of rotary machines applied to coal cutting." These he classifies under eight heads, and tells us they are not all, but will not lengthen the list at present. In answer to the—

1st. The cutter wheel has in all cases to be removed, which occupies all four minutes, and the machine is not difficult to remove from one "bank" to another. 2nd and 3rd. In all rotary machines, except the Gilloft and Copley, the machine does work its own way into the solid coal. This machine does not do so, and is, therefore, far more simple, works at less pressure, and yields a result of work which far outbalances the small advantage of cutting out a yard or two at each end of the face. In many collieries even this is not necessary, as the pits are worked with loose ends, entirely irrespective of the use of the machine. 4th. In the case of the roof falling and smothering up the machine, or the upper part of the groove falling into the part cut, the friction is, no doubt, proportionately increased, and this must apply to all machinery in common. 5. In practice we do not find that the wheel is required to work reversely, so that this objection does not apply.

6. A nodule or two of pyrites does not interfere with the working of the machine, it either breaks them up or displaces them; but I am quite willing to admit that in a seam where these are very abundant it is the one place where the pick machine might be used to advantage.

7. In this case the friction is somewhat increased, rendering a greater pressure of air, or rather slower working, necessary. Probably if the undulations are great this is a position in which the "Baird" machine would work to best advantage.

8. The machine is doing some of its most successful work where there is less than 3 ft. between the face and the props. Further, to clear up the question of cutting out the "setting-in places," &c., for the Gilloft and Copley machine, where there are no loose ends, and of which I know our competitors sometimes try to make a great point, the whole length that that has to be taken out does not exceed 5 yards, and this can be done by one man in a day when the machine is cutting in another part of the pit. This is a very trifling set against an extra quantity cut of 24 tons per hour, especially when it enables the machine to be much simplified, and to do work with a considerably less air pressure.

I now come to what Mr. Firth calls the keystone of the whole question, and I think I shall have no difficulty in showing that this part of his letter is most fallacious. The question of cutting out the ends I have already disposed of, and the cost and time of moving the machine from one face to another cannot be far different in either machine. Ours is moved easily by three men, not six, as stated

by Mr. Firth, and I expect his is not moved with fewer. I cannot see on what ground he says that the expenses of a machine which when at work uses a large quantity of compressed air are the same when doing nothing as when at work, and the risk of breakages, &c., must be taken as the same in both cases; so that for the purposes of comparison all that calculation falls to the ground. The main point of the argument is this: put the two machines down to a face (say) 700 yards long of good strong house coal, the Gilloft and Copley will undercut it in about three days, and Mr. Firth's pick, according to his own showing, will take nine. The Gilloft and Copley uses rather more air per hour, but at a less cost, because at a lower pressure, but it does three times the amount of work, and can well afford to pay the day's wage to the man for clearing out the two ends.

This statement is no boast; one of our machines is daily doing its work in good house coal at the rate of 22 yards per hour. Another engaged in taking out a tough fire-clay pricking between two coals, cuts a bank 116 yards long in three hours, or at the rate of about 40 yards per hour, and another is cutting what the colliery manager describes as a very hard steam coal, at the rate of 18½ yards per hour. In the last paragraph but one of his letter Mr. Firth has evidently got into some confusion. Judging from the figures given he is not writing about my machine at all, although he connects my name with it. Mr. Firth concludes by venturing to say a good deal. I will not venture anything, but state that he has not as yet met with any coal seam that has proved too hard for the machine to cut. I hope I have now supplied some of the knowledge Mr. Firth accuses me of having previously withheld, and I cannot do better than conclude with his words—"I have no hesitation in declaring this machine to be the most successful that has ever yet been produced."

Sheffield May 6.

ISAAC GRAY BASS.

## LIGHTING MINES BY GAS.

Sir,—Lighting mines by means of gas, if not at greater cheapness than (at present) done by candles, yet at very moderate rates, and far more efficiently, may be effected by the use of an apparatus that your Correspondent saw in the International Exhibition of last year. I think the patentee's name was Mr. M'Evoy, and that the offices were at Laurence Pountney Hill. Those of your subscribers who are much interested in the question may, doubtless, be disposed to pursue the matter further. I have never seen any account thereof in the *Journal*. The parties should certainly advertise it.

May 5.

AIR GAS.

## MINING IN NEW SOUTH WALES.

Sir,—We are still "suffering a recovery," and the more so that the simultaneous extension of three separate lines of railways—the very means of ultimately profitably opening out our mineral lands—has created such a sudden demand for labour, at high wages for short hours, that there are hundreds of miners drawn from their old work for the present. Also, the great bulk of the working miners, who "sold out" to Sydney shareholders during the "excitement," have been prudent enough to "peck out the eyes of the country" under our Free Selection Land Act, and secure good farms and homesteads with their ill-gotten plunder, previous to again taking up, in many cases, the very mines they sold to the credulous at a high figure, and which are now being abandoned for want of capital and "faith." Of course, in the long run, this will benefit the colony, as the working miners will make a claim pay well that would ruin a company, and once their farms are set going for good it gives them a good chance of taking two or three months work on the mines, and engaging less fortunate hands to work, who will not be able to rob them as they did the Sydneyites!

At Hawkins' Hill the only dividend-paying claims are Paxton-Holman's and Star of Peace, but as their neighbours Krohman's, Beyer's, and others have plenty of reserve capital, and are steadily sinking and driving, there is every probability of the rich shoots being again picked up.

At Chambers' Creek (on the same main line of reef, but some miles to the south) the English company is still steadily working, and as rich finds have been made close to them, on either side, and for over 7 miles the line of reef runs strongly defined, and wherever sunk on is gold-bearing, more or less, they stand every chance of success ultimately.

Hydraulic sluicing, so profitable in California, is as yet untried by us, but there are discoveries down to the South (about Araluen) of whole hills of gold-bearing cement and gravel, which prospect well, and are quite equal to the American deposits, in the opinion of experienced miners, and which, from their large extent, will probably rival any other gold field when once worked. In short, the more the colony is prospected the more signs and evidences of mineral wealth of all kinds are found, and (made wiser by our past losses) when we again begin to put capital and skill together to develop them, our copper, tin, lead, iron, coal, and gold will fully rival our "golden fleece."

English capitalists when asked to purchase mining property here very naturally say, "if it be so good, why is it not kept to themselves out there, when there is plenty of unemployed money lying in the banks at a low interest?" But the fact is, our population is only one individual to each square mile of country (500,000 in all), and the idle capital belongs to a few wealthy squatters and house and estate owners, whose incomes being far-and-away more than they can spend, have no incitement to enterprise, whilst the really enterprising middle class merchant finds all his energy and capital monopolised with his store, his ship, and his bank or steam shares.

There has been another disappointment at the Fitzroy Ironworks, where the coal has not proved up to the mark for smelting, but as there are plenty of other seams in the district, it is probably only a temporary difficulty. As for the iron ore itself, the quantity seems unbounded, and the quality is said to be equal to any known.

At Bogolong (to the south-west) another very large deposit of iron ore has been found, and some of it smelted by charcoal, it runs 15 to 18 feet thick, through about 400 acres, and probably much farther, and should the search for coal there be successful it will rival any mine here, as the lode is singularly well defined, rich in metal, and easily worked. About 40 miles off there has been found a galena lode, carrying silver and gold, rich in all three metals, but no one here knows how to treat it properly, and what is more, no one cares to either.

We have certainly shown some little interest lately (in trying to save some of our hitherto lost wealth) by inventing a new method of saving fine gold, and treating pyrites successfully, and the proprietors and patentees of the machine (Messrs. Lawson and Jaffrey) deserve well of the colony for their efforts. I enclose you the account of the first "public-private" trial of it yesterday, as it may possibly be of use to such English gold mining companies whose machinery does not fully save all the gold known to be in the stone.

The increasing and continuous spread of steamers and machinery in the islands of the Pacific, the West Coast of America, Japan, China, &c., leads to such a demand for our coal that we cannot supply it fast enough, and we want at least two or three more large mines opened at Newcastle in readiness for the increased port accommodation for shipping next year.

Since opening up direct steam traffic with San Francisco, the United States have begun to buy our tin, and we sent them 1703 cwt. in 1874, whilst our total export of smelted tin for 1874 was 4817 tons, and our total export of copper was 4569 tons.

In spite of past losses and crosses, New South Wales has a great mining future before it, and with skill, honesty, and capital combined—in the development of her coal and iron alone—will, indeed, prove a "New Britannia" of the Southern World.

R. ADAMS.

Sydney, Feb. 26.

GOLD-EXTRACTING MACHINE.—A number of gentlemen interested in mining matters visited Canterbury, with a view of inspecting a machine lately patented in this and the adjoining colonies, by Messrs. Lawson, Jaffrey, and Co., for the extraction of gold and silver from quartz and mineral substances. It consists of two revolving drums driven by means of a pulley and fitted on hollow axles. By means of a hopper the ore (after having been previously operated upon by stampers, or a Chilian mill) is discharged into the first of the two drums, where it is further ground by the action of a large ball, 18 cwt. (the same diameter as the hopper drum) and four small ones of 2 cwt. each; hot or cold water being introduced into the drum through the hopper and axle by pipes. About 75 per cent. of the gold is retained in this drum, and the refuse passes through a screen 20 to the inch, along the hollow axle to the next drum, which is supplied with two large balls the diameter of the drum. This drum differs from the other in that it has an outer channel filled with mercury, which the balls do not interfere with. The balls crush the refuse passed from the first drum, and the gold sinks into the mercury. The refuse after this crushing then passes into the hollow axle through a very fine grating, 1025 to the square inch, into a corrugated silver ripple and so on to the waste spout and the amalgam tub. In the second drum about 25 per cent. of the gold is retained by the quicksilver, and as the result of the trial of the machine for some months past not more than one grain to the ton has been found to pass through the discharging spout into the amalgam tub beyond what is charged with mercury. The inventors claim that although the tailings of this machine have frequently been tested, no gold has been found in them. There are openings in the drums (each of which is 7 ft. in diameter) by which the gold and amal-



gam are removed with facility. The screens in the axes can be removed, and others finer or coarser readily substituted. Yesterday afternoon the balance of a lot of quartz, from the Peep of Day claim, at Green Valley, Tambaroora, was put through the machine. It was first ground by means of a machine into a size suitable for crushing in a Chilian mill, which then operated on the stone and reduced it still further. Then it was put into the hopper, through which it was discharged into the new machine; the whole of the machinery being driven by a powerful steam-engine. More than 4 tons of the lot of stone from the Peep of Day claim has yielded from 15 to 16 dwts. to the ton crushed by this machine, although the quartz is said to be inferior to stone that only gave about 5 dwts. to the ton by the appliances used at Tambaroora. In fact the stone was set aside as worthless, and would not have been operated on but for the purpose of testing this new machine. Having inspected the machine, the company discussed its merits over some bottles of wine and a little refectory. The Hon. J. B. Wilson invited those present to drink to the success of the enterprise. He said that two years ago, when mining enterprise was at its height, and when it was known that the quartz of the colony contained plenty of gold, the great want was machinery to extract it. His friend Mr. Lawson had devoted his talents and energies to devising something to overcome this difficulty. He firmly believed that if this machine which he had invented had been in the possession of many of the gold mining companies now in the Insolvent Court, they would be at work now. He might be wrong, but he believed that the great advantage this machine would have over others would be that it would utilise five or six tons of tailings every day, and extract from them gold that would otherwise be lost. He believed he was safe in saying that the machine was a complete success, and that the enterprise of Messrs. Lawson, Jaffrey, and Co., was calculated to be of great benefit to the colony. Mr. Lawson responded to the toast, and explained the working of the machine. He stated that he had at first crushed some 10 lbs. of stuff by means of a ball in an iron basin, and extracted the gold from it. He thought what he thus did by hand could be done by steam in a larger way. So he set his brain to work, and with the aid of his friend, Mr. Jaffrey, the machine was made. At the present time they could do from two to three tons of stone per day with the machine, if it was not charged too much with iron. He explained how the ore was roasted on the premises with the view to the removal of arsenic and other substances. In reply to questions from Mr. Bensusan and others, Mr. Lawson said that if the screens in the hollow axes were larger more stone could be put through the machine. During the four or five months that it had been at work they had culled upon persons whose quartz they had crushed to take the tailings away, with the view of trying whether they contained gold. This had been done, but no gold had ever been discovered, and he was satisfied that it could not be found. The machine had saved the very finest gold. He thought that the cost of the machine, which could be readily fitted to stampers or a Chilian mill, would be about 500*l.*, and that it would be a most valuable and economical gold-saving machine on the mines of the colony. The inventors claim as their invention—first, that it is a new and inexpensive method for the extraction of gold and silver; second, superior grinding power and economy of motive power; third, the method of feeding and discharging from the hopper or tubular axes; fourth, revolving ripples; fifth, continuous feeding and discharging of the drums. The company, after inspecting the roasting furnaces, where arsenic and other ingredients are removed from the mudic, then returned by omnibus to the city.—*Sydney Morning Herald*, Feb. 25.

Although everything at Hawkins' Hill has been quiet during the week, the correspondent of the *Sydney Morning Herald* writes that there is a great deal of speculation on the result of Paxton's crushing, which was commenced last Thursday, but the general impression is that it will be insufficient to pay a dividend. They are now getting ready to sink on the Star of Peace vein. The total of crushing was 1521 ozs. 12 dwts., from 400 tons.

#### MINING IN QUEENSLAND.

Sir,—The long-looked-for rain has come at last, and, as is usual here, it has come in excess—floods being the rule during the past fortnight all over the southern portion of this colony, the tin fields of both colonies getting their full share. A good deal of damage has been done, most of the workings being drowned out, dams washed away, and work for a short time suspended. Gympie has also been flooded, all the works, deep and shallow, in all the claims being flooded with surface water. Still, so far as the tin fields are concerned, a flood is preferable to a drought, as, owing to the latter, the tin received at the Warwick terminus during the month of January was only—

	Tons	cwt.	q.	lbs.
Stream tin	277	5	0	24
Ingots	5	17	2	12
Total	283	2	3	8

Showing a reduction of 155 tons on the previous month (Dec., 1874), and 47 tons less than the same month last year (Jan., 1874), but during the dry weather there were large paddocks of good wash-dirt secured from leads inaccessible during wet weather, and which is now going through the sluice boxes, so that so soon as the roads are possible we may expect a large quantity to arrive.

The smelting works at Stanthorpe have not so far proved themselves very successful, if we are to judge from the quantity coming down. I hear there are furnaces erected on the New South Wales side, right in the heart of the mountains, which have already started smelting, or will shortly do so. Our local smelting company (the Queensland Smelting and Assaying Company) is still working away, kept fully employed, their brand, I am glad to see by the account sales, always topping the market.

We last week (Friday) received news by wire of the "considerable fall" in the tin market. This fall, I expect, is owing to the number of Brisbane, Sydney, and Melbourne vessels all arriving in London with the early wool, and all having considerable quantities of slab tin on board as ballast. If your reader's will refer to the London imports for the last five months in 1874, they will find a very small quantity of Australian tin arrived, while a very large quantity in proportion arrived in January and February this year. The tin accumulates in the bottoms on this side as ballast, waiting the arrival of the early wool, all of which is in London in time for the February sales. The fall which, from the words telegraphed, must be serious, I expect is only temporary, our increased production cannot have any such effect. The wet season is not yet over at the Palmer; so soon as it is there will be an extensive rush again to that field. Preparations by old diggers returning, and new ones that have not the slightest idea of the hardships before them, being met with in all directions, those men who have come down from the field have fully demonstrated the richness of the field, while the fact of the whole of them, or nearly the whole of them, preparing to return, speaks volumes for the permanency of the field, as gold diggers seldom or ever care to go back to a gold field after once leaving it.

In conclusion, I enclose you the *Brisbane Courier's* last Friday's leader. I may mention that we have philanthropic editors here, judging from the enclosed, but I have not yet met with a philanthropic merchant during my 13 years residence in Queensland. No tin has yet gone to China or India direct from here, nor, so far as I can learn, is there any likelihood of such an event for some time to come.—*Brisbane*, March 2.

#### THE THARSIS COMPANY, AND MR. HENDERSON.

Sir,—Having been from the commencement deeply interested in the success of the Tharsis Company, I crave the favour of your insertion of the following remarks upon Mr. Henderson's recent letters. I was present at the meeting, and took note of all that was going on. The opinion I formed was that there could not have been any serious intention on the part of Mr. Henderson to propose the amendment about which he has written to the newspapers, as all that passed was well heard and understood, even at the back of the hall. Besides, even had he been prevented from proposing the amendment, he could have said all he was anxious to emit on the after motions had he so chosen—indeed, his failing to do so was commented upon by shareholders on retiring.

His statements respecting the prices at which pyrites and iron ore have been sold for this year have been effectually dealt with by Mr. Tennant, and we cannot expect him to enter into further controversy with Mr. Henderson, or give him further details. It is sufficient for the shareholders to have the assurance of the Chairman, as given at the meeting, that the sales of pyrites for this year already are nearly equal to those of all last year, that the deliveries to consumers hitherto are greater, that the prices are a fraction lower than last year, but that this is more than compensated by lower freights. As against this Mr. Henderson's details of what his necessities force him to sell at can be of little interest to the shareholders, and of no value in estimating the future dividends of the Tharsis Company.

Copper so far this year has ruled 5*l.* per ton higher than last year, and is considered likely to do so at least, as Mr. Henderson could have found by referring to authorised circulars. His calculation of the profits per ton of ore is as fallacious as can be, and carries its own refutation, even to men who have not been accustomed to work upon figures for a confiding public. The profits must be calculated not upon the output of the mine, but upon the quantity manipulated; and this could not have been more than 200,000 tons, judging from the quantity of iron ore produced, and reckoning back on Mr. Henderson's standard of 70 tons of iron ore for 100 tons raw ore. This 200,000 tons, therefore, has earned the profits of the year (as little was produced from precipitate, owing to the drought having

prevented the washing of the calcined mineral); and, besides, it has borne the costs of extraction of the large quantity of ore put for calcination and to the waste heaps, the copper from which will be percolating out in dividends long after Mr. Henderson is forgotten.

If the mind of Mr. Henderson, or any other equally large shareholder, is exercised by fears of the future of what he truly calls this splendid property, I think their doubts may be allayed by recalling what the company has done in the nine years of its history. A review of its reports and balance-sheets shows that the company has earned overhead during its existence more than 25 per cent. per annum of undoubtedly honest profit, and that during a period in which prices of sulphur, copper, and iron ore have been at the lowest ever known in their history, since they became of any commercial value whatever. What has been will be. The bugbear of opposition is entirely chimerical. The disadvantages under which any new company labour as compared with the Tharsis Company are so great as to make it a moral certainty that they cannot work at a profit unless the Tharsis Company are earning their 25 per cent., a fact which is, perhaps, better known to Mr. Henderson by recent experience than to any other. If the Tharsis shareholders were disposed to retaliate on Mr. Henderson for his attempt to depreciate their property, they might put to him a few questions about the Huntington, Canadian Pyrites, and Concordia Companies, of which he, no doubt, likewise consider himself an originator, and of the latter he is certainly managing director. The peace of these happy associations is not disturbed by any difference of opinion about how much dividend they may venture to pay, whatever other sore distresses they may have.

#### RICHMOND CONSOLIDATED MINING COMPANY.

Sir,—As the Journal is considered by your subscribers (of which I am one) as open to all and influenced by none, I hope you will give this appeal insertion in your next number. This company for the last two years has had its shares tampered with by the influence of the "Bears," and, singularly to say, the "Bears," by advice given them by one who has given them something like the "straight tip" of information for "rigging" shares, have the past week metamorphosed themselves from "Bears" to "Bulls"—at least two of the so-called animals and friend, hence the sudden rise in our stock; not from any real cause, as the furnaces are shut down, and no cables of any returns. I am not a very large holder of this stock, but, whatever my former confidence in the mine may have been, I begin to fear the result of such rapid advances under such circumstances without any real cause. Caution is prudence, lest we follow the rigging of our sister mines—the Emma, Eberhardt, Last Chance, Flagstaff, Tecoma, and Colorado Terrible. Of the latter we have had during the past week such an exemplary specimen of American security of property by patents, and the opening given to blackmailing. If the Richmond is the mine we are induced to suppose it to be, let it stand on its own merits, and not delude the outside public by getting the price of shares 300 per cent. above par in the absence of any legitimate cause. We have seen the consequence of rigging in all the American mines—defunct, and those now in abject bankruptcy. Let us have legitimately earned dividends at stated quarters, and not try, as others have done, to ruin the unguarded by stock jobbing rigging the shares up to absurd value. If I find this "bulling" continue I shall part with my shares, and say to others—Take a hint in time; go and do likewise. A SHAREHOLDER.

Kensington-square, May 6.

#### RICHMOND CONSOLIDATED MINING COMPANY.

Sir,—Permit me to sound the note of warning respecting this mine. The 5*l.* shares were quoted a few days ago at 7*½*, they are now 8*½*, a rise of 21 per cent. within a week. Is this the result of a hearty "bull" speculation on the Stock Exchange? Or is it a fair and genuine rise in the intrinsic value of the shares? I think the former, as no information has reached the office respecting further discoveries; the furnaces are now shut down, yet at this particular moment when the mine is earning nothing it is rumoured the directors have seized the opportunity of increasing the dividend; if it is true, it certainly does not speak much for their wisdom, and when I remember the Chairman is also the vice-Chairman and ruling spirit of the unfortunate Mammoth Copperopolis, whose 10*l.* shares are selling at 2*s.* 6*d.* per share, my confidence in the financial management of the Richmond is not very great; therefore I certainly advise the shareholders to sell at the high prices now prevailing, as when the "rig" is over they will regret having missed the present opportunity.—*London*, May 5.

JOHN MARTIN.

#### PORT PHILLIP AND COLONIAL GOLD MINING COMPANY.

Sir,—When the late Mr. J. D. Powles wrote the first report of this company, he described the mines as being the very eyes of the gold mines of the colony of Victoria. The late discoveries appear to corroborate this statement, and I have no doubt but all the lodes will be found highly auriferous and rich. I certainly think a dividend ought to have been paid to the shareholders a considerable time back, and if so much wood had not been laid in stock there would have been ample funds to have done so. The mine has been steadily developed during the first lease of 21 years; and now that another has commenced I say divide the profits. I certainly think that, as Mr. Bland has laid so large a stock in hand of firewood, the directors may very consistently borrow sufficient from the reserve fund, and replace the same from remittances to come. There is more than 3500*l.* in hand here, and less than 1300*l.* would suffice to pay a dividend at once.

JUSTITIA.

#### PORT PHILLIP AND COLONIAL GOLD MINING COMPANY.

Sir,—I purchased, on receipt of the good news by wire from Australia, 300 shares in this mine, at the price of 25*s.* per share, less a very small fraction. To-day, to my apparent dismay, I find the quotation of these shares to be 15*s.* 6*d.*—that is, 17*s.* 6*d.* per share—a cheerful prospect for me as a buyer, if I did not know a little about "changes." In knocking down the quotation of this property the brokers and jobbers suppose they can lessen the value of the quartz discovered? The reef in the eastern set has, in reality, not been fully proved, and of what value the quotation of a broker, should the news proclaim 2*ozs.* or more per ton in that part of the mine? Perhaps some patient but foolish (large) shareholders are realising the rise in the shares, and, therefore, unduly influence the market by pressing them upon it in large numbers. These shares commanded 2*l.* each in days not so far back, when the value of the gold quartz was mild indeed compared to the present wildness. Perhaps the brokers want to extract the oxygen from the shell, and to get these shares into their own hands, who knows? I, for one, however, remain quite satisfied with my bargain, although, perhaps, smarting from temporary irritation at the stupidity of sellers in this great wealthy colonial enterprise, being so easily cajoled out of their shares just as the great expectations of development are on the point of being realised. If I had 300*l.* lying idle at my bankers it should at once be employed in purchasing a like number of Port Phillip shares.—*New Cross*, April 6.

INVESTOR.

#### PORT PHILLIP AND COLONIAL GOLD MINING COMPANY.

Sir,—The letter of your correspondent, signed "Shareholder," showing the fortunate strike of gold in this company (about 1*½* oz. per ton) in the Eastern Reef, with every probability of an increase, causes a strong belief that this property must now turn out richer than it has ever been during its dividend years. I notice that Port Phillip has returned 1*l.* 8*s.* per share—that is, 140,000*l.*—to its proprietors, or, in other words, reimbursed the entire capital, and nearly half as much again. The present price of 25*s.* per share is a mere bagatelle in comparison with the quotation some few years since, being then at 1*l.* premium, the quartz being nothing so rich in the yield of gold at that time. The last dividend paid was in January, 1872. One or two favourably distinctive features in Port Phillip may be here noticed. The last report of the directors was not unfavourable for the future of the company, and this opinion was supported by the mining captains. The rich quartz struck is only driven on a short distance, but by the latest telegram received from the most confident shareholders. The expenditure was lessened by some 1200*l.*, and the saving in reduction was 3*d.* per ton of ore crushed. A reserve of 8000*l.* stands to credit of the company, in great part invested in the Australian funds. Mr. Bland has reported the machinery to be in excellent order; Mr. J. Lewis, M.E., gives in his report his opinion, and says,—"I believe that the present operations are being carried out with judgment, and I have no doubt will prove remunerative." Now, this opinion is already realised beyond all expectations. In No. 4 level an excellent feature presents itself for development, of a rich strike,

inasmuch as the stone in the adjacent mines has proved to be exceedingly rich in this spur. The new expected on the 29th inst. is looked forward to with the greatest interest. The unlimited crushing machinery, the finest in the world, and pit a second time to the adventurers, especially with the quartz now struck in the eastern and western reefs, and to place Port Phillip in the first ranks of all colonial gold mining companies. The return of 800*l.* profit by the latest telegram is excellent, but the results to be attained when the eastern reef of 1*½* oz. per ton is extracted must prove not only gratifying, but, indeed, a matter of congratulation to the old shareholders in Port Phillip shares.

SHAREHOLDER.

#### EXPLOSIVES IN MINES.

Sir,—In reply to the letter of "A. B." of April 23, it appears he makes a mistake as to my reply last week, for then I stated that dynamite was not on the decrease in the Camborne district, but the reverse was the fact. I now reiterate the same words, that dynamite is more freely used than it was three years ago; but by the manager of Tincroft and Carn Brea Mines it is not tolerated, and he is the only manager in the two counties of Cornwall and Devon that does not order it for the use of the men working in these mines. In some mines the men are allowed to use either the powder or dynamite; the price charged to the men for powder per 5 lbs. 3*s.* 4*d.*, for 5 lbs. of dynamite 18*s.*, and the result is that there is very little powder used, and at this time they are using about 800 lbs. of dynamite per month. But I should like "A. B." to understand in the latter mine the men have certain contracts—not as in some mines, mock contracts—and allowed 3*d.* or 3*d.* 10*s.* per month; the best part of men get the most money, and what they get they are allowed to have, which, as I have been told by some of the working men, is not the case in all mines. If "A. B." will come to the next account at Carn Brea we might be allowed to have a few minutes' discussion on the merits of powder and dynamite. I invite him to come, as I intend to make some further enquiries respecting Captain Teague's statement at the last meeting of the shareholders.

Camborne, May 5.

STEPHEN WILLIAMS.

#### MINES WATER SUPPLIES FOR ORE DRESSING PURPOSES.

Sir,—It seems to me worth the notice of those who have the management of mines, where water supply is entirely dependent upon the rain that falls—e.g., South Prince Patrick, Halkin Mountain, North Wales—that more attention is not given to the question of such supply being materially assisted by the use of hydraulic rams; those by Mr. Blake, of Accrington, would doubtless be found highly efficient in sending water any distance, and up to many hundreds of feet in height, so as to supply any cisterns used for water storage. The first cost is not large; the machines are self-acting, strong, and will work with a fall as low as 6 in. Surely there are streams of water within a mile or so of Halkin Mountain that are capable of being utilised, and thus render companies thus circumstanced independent of drought. I wonder Mr. Blake does not advertise his apparatus in the Journal for the benefit of those who may not know of the utility of his invention.

NORTH WALES.

#### CORNISH MINING.

Sir,—I notice in the Journal of April 24 a letter from Mr. Wm. Teague, jun., dwelling on the advantages of an association of gentlemen connected with mining, showing the great need for it, and urging its immediate adoption. There is no doubt that such a combination would be very powerful and effective in sweeping away very many of the abuses which stain the name of mining, in exposing palpable swindles, and creating a healthy feeling of confidence in many who are now very shy of touching mine shares. But the time seems at present to be very far distant when mining men shall be allowed to use their own discretion and judgment in buying in the cheapest market and selling in the dearest, for now, instead of the adventurer's interest being foremost in the minds of the executive, the merchant's is the prime care, then the smelter, besides that self-interest everybody in a more or less degree looks after; when the misty look of the mine accounts (arising from their being "cooked" and very often overdone) will be followed by a state of affairs where order and simplicity are a characteristic; the time when this will all happen, and shareholders will unitedly struggle against combinations of adverse circumstances, will never come in Cornwall. For there are in connection with mining too many clashing and opposite interests. We know that combination does wonders, but what united effort, however great and sustained, can raise the price of metals from the natural trough of depression? What person or community can, by united investigation, effort, resistance, or protest, affect in any degree the downward current of affairs? Down everything goes, and has been going for two years past, and neither a Miners' Association, or any other, can interpose an effectual barrier until matters reach their worst, when in the order of affairs they will mend. Any puny efforts of an association of Cornishmen will only appear ridiculous. No man of sense ever matches himself against time, the tide, or a railway train; and this is the strongest of all tides, an ebbing commercial one, which carries on it Cornish mining among many other things. It is simply in one word—irresistible. This interposing a barrier called an Association of Miners reminds one of Mrs. Partington's well meant but unsuccessful endeavour to sweep back the aroused and encroaching Atlantic with a mop. What honest Mrs. P. could not do the turn of the tide did; and what no body of Cornishmen, call it a miners' association, or a society for the prevention of decline in metals, what this cannot do, and never will do, time will in its due course effect. To struggle against this reaction is as futile and almost as dangerous as fighting with an angry tide. The only thing that is not out of place is to let the metals right themselves, to be quiet, steady, stern, and ever watchful, so that when the reaction comes (as it certainly will) the full advantage may be early reaped.

"The foreign market can be competed with by Cornwall successfully." Can Cornwall compete with Banca?—Yes. With Queensland?—Yes. With Peru?—Yes. With each singly, but not with the three combined. Take affairs at present as a test. Are we better or worse for this foreign competition?—It is swamping us. It is utterly useless to disguise the fact, to envelope it in flowing drapery to hide the skeleton behind, to call disaster pretty names to make it less appalling. What produced this last depression?—The overwhelming supply of tin in ore and metal from our Australian provinces (chiefly Queensland), coupled with heavy failures in America, which considerably lessened the export of goods to that country, and among these goods tin was a very important article. I do not mean to state that Cornwall will not be as prosperous as ever in a year or so, but this Australian and other tin must cripple our tin mines eventually, spite of all combination.

But although I believe the sustaining or affecting in any way the metal market to be out of the province of individuals, there is plenty of work besides this for a new and strong association to deal with. There are "homebred conditions to be met," homebred and home nurtured evils to be stamped out, evils as glaring as noxious, which are cankering Cornish mining. Let old poor, and young worthless, mines be stopped, and let every company, every merchant, every miner subscribe, each in his proper degree, to this Miners' Association Phoenix, let it have scope and means, and then we shall see a new era. "There is that which scattereth abroad and yet gathereth in," and the money so collected could be well expended. Let trial shafts be sunk in new districts if favourable indications are found. Immense beds of manganese exist in Cornwall, enormous deposits of lead, fabulous quantities of iron, and many untried or unworked districts seem favourable for the production of copper and tin. Then the county will be its own busy prosperous self again. Elaborate and practical experiments might be made on the economy of fuel which escapes in such volumes of smoke from our tall chimneys, on the corrosion of boilers by acids in water, and the best means of preventing it; on the most economical form of boiler, whether high or low pressure engines were better adapted for mining on a small scale, and many other things of equal importance.

Dealing with the economy of mining, nothing is truer than that by overweening greed in reducing the miners' wages to that enforced line of boundary, zero—starving point—the best men have been driven away to crush their fatherland by sending home foreign metal in opposition to home production. How can men be expected to work for 2*s.* 2*d.* per day, which is, I suppose, the average remuneration of a Cornish miner now? Wonderful generosity. Look at the poor fellows vegetating with a needy family on 2*l.* 10*s.* sterling



per month, or 1s. 8d. per day, including Sundays, and yet so weak the spirit of cohesion that the poor fellows will not combine under these circumstances even. Send them away out of the country, out of this painful degradation, give them all the advantages of free emigration, so that they may be fed and clothed and taught decently as men, not as starveling slaves. To parody some of Pope's best lines (if it be not wrong to deface anything so beautiful)—

"So the poor miner, whose untutored mind  
Sees starvation in the future,  
And misery in the past behind."

Mining is in a crisis, and we hope to see it recovering by degrees till it reaches its former health and vigour. When coal has reached its lowest point, if it has not done so already, trade must rally, and then we may confidently expect a vastly improved state of affairs.

EXPERIENTIA DOCT.

#### SURFACE DRAINAGE.

SIR.—The subject has, I find, again cropped up, this time under the fatherly care of the Miners' Association. Although I cannot claim originality, yet, as you were good enough to insert a letter under this heading from me some months back, I again crave like favour. At that time, after demonstrating the utility of surface draining—referring particularly to the Camborne mining district—I asked, "Could not such a system be carried out at a comparatively small cost, compared, I mean, with the immense cost of keeping engines continually pumping, &c.?" No one has answered this, because no one has, I suppose, taken sufficient interest in the matter to go into figures, nor was I myself at that time prepared with any facts as to the actual cost of such surface draining. This, of course, greatly depends on the roughness or completeness of the work. Three-inch drains could be made in Cornwall for 25s. to 30s. per 1000. For the effectual drainage of an acre of land about 2000 of these are required—cost in material, 3s. about. To lay these pipes 3 ft. deep would cost about 5s. an acre, or perhaps a little more; from this it is evident that 10s. per acre would cover all expenses, with every extra. Then comes the question, how many acres should be laid in any district? Take the Camborne and Redruth district again, or the mines lying around and between these towns included in a line drawn from Stray Park to the Grenvilles, through the Bassets and Unys and back by the Tolgus, including all the mines lying within this line, and the total area may be about 12 square miles. Supposing only half this were drained, it would cost between 30,000l. and 40,000l., and no one connected with mining is prepared to expend this, or any part of it, at present. Mining is so precarious a property, especially at present, that the risk would be too great. If, however, a thorough system of drainage were to be carried out the cost would probably exceed 60,000l.

At the meeting of the Cornwall and Devon Miners' Association, Mr. Collins touched the right chord when he spoke of the great difficulty in bringing about a combination of different mines; and as so many of the mines in the district are either "knacked" or in difficulties, this is not at all a time for the prosecution of a work of such magnitude. Still, some gentlemen who have faith in the efficacy of drainage should subscribe a sum, and get an engineer to go over the ground and estimate the cost of laying pipes. If his answer is favourable, well; otherwise, then attention must more than ever be directed to the adits, which should be thoroughly and periodically examined, and always kept in a state of repair. That was a sweeping and bold assertion that we have 40 fms. of adits to every one required, and it needs confirmation. The work the late Mr. Michael Williams accomplished was the boldest, grandest, and most effectual and philanthropic undertaking in the annals of Cornish mining, and like most of his work, it was thorough. Will anyone supplement these remarks and oblige.—May 4.

N. B.

#### LEAD MINES—LEAD SMELTERS.

SIR.—For the last few months I have noticed a considerable drop in the quotation for lead, and more especially in the price of lead ores in the principal leading lead mines of this country, such as Great Laxey, Van, Roman Gravel, Minera, Tankerville, Dyliffe, Pennerley, Foxdale, &c. I, and indeed many others, could not understand the reason for such a fall, and I think that the mines enumerated have a just cause of complaint at the low prices paid for their ores, as will be seen from the following facts. A month ago I find the price of lead was 20s. 10s. to 21s. per ton. The Van Mine sold their ores on April 8, which brought 14s. 16s. 10d. per ton. The price of lead quoted on the 6th inst. was 22s. 15s. to 23s. per ton, being, it will be observed, a rise of 2s. per ton in the month, and yet the smelters give but 15s. 5s. 10d. per ton for the parcel of ore sold on the same day (6th inst.), being 7s. per ton advance, instead of an increased price of nearer 22s. per ton, which ought to have been given. The prices received by the other mines named are equally, if not more, to be complained of, and it is, therefore, high time that the directors of the several companies mentioned considered the desirability of some combination for the purpose of obtaining better prices, or otherwise erecting smelting works, which could easily be done, so as to command the whole of the lead ores produced by the foregoing mines.—May 6.

A LOOKER-ON.

#### MINING SHARES.

SIR.—One thing in mining strikes me as something extraordinary, and that is the high price at which some mines are quoted, and the low price at which others are named, the reason in both cases being something which requires the knowledge of a student of the science of investment to understand. It is in the hope that some one of these students, or the great promoter of the science itself, will deign to cast a little light upon the subject, and lead an enquiring mind into those paths of knowledge which appear to be possessed by this class in such an exalted degree. Let me first mention East Pool, which has not paid a dividend since 1872. A few weeks ago the shares were quoted at 12s., or something over 72,000l. for the mine. Again, Peavor shares touched 7s., without having paid a dividend at all, and instances of this kind may be quoted without number, and must be well known to the readers of the Journal. These two are illustrations of mines quoted at what many will think to be rather high prices. Now let me mention another, in which I am interested, and one which is not even quoted by the Journal from one month's end to the other, and when it pays a dividend the event is thought to be of so little importance that, whilst laudatory paragraphs of West Esgrail Lye and other mines of a similar character are continually placed before the eyes of the reader, Penhalls and its dividends are left out in the cold. What tin mine, besides this, in Cornwall has paid during the past year, ending April 30, four consecutive quarterly dividends? True, those dividends amounted in the aggregate to but 8s. 6d.—they were, nevertheless, paid each consecutive quarter, and I now see that if I wanted to part with my shares I should have to take about 30s. each for them. These are instances of the high and low prices in mining shares, instances which could, no doubt, be multiplied, but I fail when I endeavour to find for myself a satisfactory reason why non-dividend mines, and mines in their infancy, should reach such high figures, whilst mines steadily paying dividends should remain so low, and it is in the hope that some one of your readers will enlighten me on the point that I have penned these few lines.

B. J.

#### WHEAL WREY, LUDCOTT, AND NORTH TRELAUNY MINES.

SIR.—For the information and guidance of your correspondent in last week's Journal signing himself "Argentiferous," in allusion to the above-named mines, now about to be resuscitated under one management, I beg to state they are situated in the parishes of St. Ive and Quethiock, about three miles from Liskeard, being quite another silver-bearing district, and distant over 50 miles east of Wheal Rose. It is adjacent to Trewetha, Trehan, Trelawny, and Wheal Mary Ann Mines, which paid dividends for many years, as well as Wheal Wrey and Ludcott Mines. These three sets, now combined, are very extensive, and extend 1½ mile from north to south on the run of the lodes. The adit level is about 30 fms. deep from surface. Wheal Wrey engine-shaft is sunk to the 140, Ludcott to the 106, and North Trelawny to the 60 only. A large number of shares are being locally subscribed for, which is the best indication of the estimate held by those who are acquainted with these mines.

It is expected the whole of the necessary erections will be complete and the mine drained within six months, and under the supervision of their able and well-qualified manager there is a certainty of its being carried out efficiently, and with the utmost economy and vigour. No doubt the future sales of ores will be the best test of profit to the general body of shareholders.

M. W. BAWDEN.

Mining Offices, Liskeard

#### HINGSTON DOWN MINING COMPANY.

SIR.—My attention having been called by several of our shareholders to a paragraph which appeared in last week's Journal, I have to request that you will kindly insert these few lines.

In the first place, Wheal Crebor is several miles from Hingston Down, and no discovery or improvement that may take place at the latter mine can in any way affect the value of Wheal Crebor. Secondly, the ends and winzes, as reported by the writer of the article in question, are not in accordance with the agent's report on p. 470, and which the shareholders may take to be the true and actual value of the several points of operation. That the prospects of this mine are much improved all must admit, but it is hardly fair to make use of one property for the purpose of attempting to enhance the value of another with which there is not the least connection.

Cornhill, May 7.

T. B. LAWS, Sec.

#### SOUTH PRINCE PATRICK LEAD MINING COMPANY.

SIR.—The third dividend of 10 per cent. (2s.) has been paid—April, 1875—making 6s. in 14 returned to the fortunate shareholders in this company. The mine is looking well; and the management have every hope of being able to keep quarterly dividends of 10 per cent., if not more.

HALKIN MOUNTAIN.

#### ST. PATRICK MINE.

SIR.—The interest manifested in the success of this new property, situated near Holywell, in Flintshire, amongst, and in the very centre of a group of very rich lead mines, has by no means lessened. The shaft being now timbered and complete to the depth of 120 yards, the A B C work of driving the cross-cut to intersect the known numerous rich lodes lying *perdu* will commence immediately. The small capital of 6500l. for the venture makes it at once become a little prize in the eyes of practical men, and the proved enormous wealth in the adjacent mines renders it a pretty certain success, reducing risk to a minimum in this case. The shaft being sunk at a large expense by the former proprietors, the chief attraction, the doing away with all the vexatious delays and loss of money. The shares command a premium of ½ to ¾; probably they will be eagerly enquired for at 17 premium on the tapping of the lead, an event which may now be daily looked forward to. It is seldom that this rich opportunity of netting cent. per cent. (at the lowest calculation) offers to the investor. Prince Patrick, whose shares stand at 3s. 15s., has a capital of 18,000l., valued now at just 70,000l., and paying large dividends on it. St. Patrick has all the lodes of these adjacent mines running through it. What more can be desired?

G. L.

#### SOUTH WHEAL FRANCES.

SIR.—I have noticed several letters in your valuable Journal respecting this mine. The report issued to the shareholders in November, and a reflection upon the management of the mine, because neither the agents or the adventurers thought it wise to adopt some crude and silly notions suggested by Capt. Goldsworthy, of South Ward, who inspected the mine for a purpose, and reaped a just recompense in being bitterly defeated by a large majority. These effusions were evidently written by a man, an educated man, no doubt hired for the purpose, who is probably as ignorant of the details of tin mining as Capt. Goldsworthy appears to be. They are also intended to soothe the wounded feelings of the rejected, and to gratify the curiosity of the defeated. I have hitherto looked upon these effusions with utter contempt as containing nothing of a practical character, and should not waste my time, nor solicit your kind permission to reply, but for the arrogant and defiant manner this master of grammar and syntax has assumed. Very few mine agents who have worked their way up through every difficulty from the tail of the bundle to the management of a mine can boast of their learning, but when a man of Capt. Goldsworthy's calibre assumes the critic, practical men, especially those who know him, may blush, and must be more cautious about their compositions in future. I have received several communications from Capt. Goldsworthy, and am well acquainted with his usual style of writing, from which I infer that he knows quite as much about the composition of the moon as he does of syntax, and should he come before your readers again I trust it will be in the character of a practical miner, and not as a scholar. Capt. Goldsworthy, in reply to "Miner" in last week's Journal, says "that he did not see every stop," but it is my painful duty to say he did not. It is true he saw the principal stops, because they were easily seen, but there were other stops he did not see, although invited to do so. Neither did he see the tribute pitches, or take any samples of tinstuff to assay in order to make himself acquainted with its value, but simply imbibed what he was told, and gave his report accordingly. I must here do him justice, and give him credit for two things—first, for advising the suspension of old stops and tribute pitches, then giving a clear profit to the advantage of more than 100 per cent. monthly; secondly, for having given his advice as to where West Basset great tin lode would be found, without even taking the trouble to measure a foot of ground or inspecting the mine. I fancy that many of your readers will concur with me in believing that Capt. Goldsworthy stands pretty much in the same position in relation to this mine as a fortune teller does to the ignorant and credulous, that out of a multitude of words some probably may become true. His remarks respecting the quantity of tin sampled, and the quantity sold are wide of the mark, and so unpractical in their bearing that I must here decline to review them, further than to ask the following questions. Can Capt. Goldsworthy assay a tin sample? If so, is it possible to catch all the tin in the sample contains in the usual and ordinary way of assaying tinstone? A. T. JAMES.

Redruth, May 5.

#### CALDBECK FELS CONSOLIDATED LEAD AND COPPER MINING COMPANY.

SIR.—Having been a shareholder in this mine for a number of years, during which time I have received no dividend, I venture to ask if any of your numerous correspondents can give me any information concerning the property? When first induced to become a shareholder I was informed that the mine simply wanted developing to become dividend paying. Not being practically acquainted with mining, I am unable to say what would be a fair time to allow for development. The process has taken six years already since I became interested, and for anything I can tell may last much longer. This may not be unprecedented in the annals of mining, but is anything but comforting to *bona fide* investors, who do certainly look for some return for their capital. Probably some of your readers may be better informed as to the state of the property than I have any means of being.

A SHAREHOLDER.

#### ST. AGNES CONSOLS—PRICE OF SHARES.

SIR.—On many occasions very favourable reports have appeared in the Journal of St. Agnes Consols, which mine has opened out so far most favourably. Considering that the prospects are so good, there appears a singular difference in the price of shares as quoted in your list, May 1—5½ to 6—to that of Mr. T. E. W. Thomas's, who has buyers at 2½ and sellers at 3½. Now, it would be desirable to know which is correct, for the public look to the Journal as the authority in mining matters.—May 5.

INVESTOR IN MINES.

[For remainder of Original Correspondence, see to-day's Journal.]

#### FOREIGN MINING AND METALLURGY.

At Paris copper has maintained former quotations pretty well. Chilean in bars, delivered at Havre, has made 85l. 10s.; ditto ordinary descriptions, 83l. 10s.; ditto in ingots, 83l.; English tough cake, 87l.; and pure Corocoro minerals, 86l. per ton. At Havre, Chilean, first marks, has made 86l.; current marks, 85l.; and Lot and Urmeneta, 84l. per ton. The German copper markets have been rather quiet. The Paris tin market has shown some little weakness. Banca, delivered at Havre or Paris, has made 94l.; Straits ditto, 92l.; and English, delivered at Havre or Rouen, 92l. per ton. At Rotterdam tin has continued feeble. Some transactions have taken place in Banca at 51s., but at the last dates there were sellers at 50½s. Billiton has been offered at 47½s. Tin has been rather feeble in Germany. Lead has been pretty well supported at Paris. French lead, delivered at Paris, has brought 21l. 16s.; Spanish, delivered at Havre, 21l. 12s. per ton; and English, 21l. 12s. per ton. At Havre, Spanish has brought 21l. 4s. to 21l. 8s. per ton. The German lead markets have been rather feeble. Zinc has slightly fallen at Paris. Silesian, delivered at Havre, has brought 24l. 8s., and other good marks, delivered at Havre or Paris, 24l. per ton. Silesian zinc has been quoted at Havre at 25s. to 25½s. 4s. per ton. The German zinc markets have continued firm, but there has not been much activity in affairs; quotations have not varied materially.

Business continues to be sharply competed for in the French iron trade, and transactions have not been very numerous. It cannot be denied that a certain movement is observable, but at the same time it is very feeble, and great abatements in prices are remarked in all adjudications. The production of pig for both casting and refining has become difficult, in consequence of foreign competition. Iron, which had experienced a slight advance, has almost immediately again fallen. The depression in affairs does not appear to be peculiar to France, but it has become general. The production of pig of all kinds in France last year is officially returned at 1,402,122 tons, as compared with 1,018,900 tons in 1869, the last year before

the Franco-German war. As compared with 1869, the production accordingly increased last year to the extent of 433,223 tons. In this increase pig made with mineral combustibles figured for 333,183 tons. The production of iron of all kinds in France last year amounted to 768,437 tons, as compared with 761,409 tons in 1869, showing an increase on the five years of 7028 tons. The production of plates in France last year amounted to 117,154 tons, as compared with 101,952 tons in 1869, showing an increase in the five years of 15,202 tons. The production of steel in France last year amounted to 214,458 tons, as compared with 97,285 tons in 1869, showing an increase in the five years of 117,173 tons. Cast-steel was also made in France last year to the extent of 7227 tons, as compared with 7562 tons in 1869. The Société Nouvelle des Forges et Chantiers de la Méditerranée has been paying this month the balance of its dividend for 1874, at 17. 4s. per share.

The French coal trade is rather anxiously looking out for orders. The exaggerated pretensions of holders somewhat check business, it is to be feared, as consumers courageously resist these pretensions, in consequence of their faith in a further decline in quotations. Meanwhile there is little change in prices. The Administration of Public Assistance at Paris is about to let a contract for 17,000 tons of coal. The production of coal in France last year is officially returned at 17,059,547 tons, as compared with 13,216,623 tons in 1869, the last complete year of unbroken internal tranquillity enjoyed by France before the Franco-German war, showing an increase in the annual extraction in five years of 3,842,924 tons. A line of small river or canal steamers is about to commence running between Paris and St. Quentin, Cambrai, Douai, and Lille. The Carmaux Mines Company has been paying this month the balance of its dividend for 1874, or 3l. 4s. per share.

The Belgian iron trade is still in a rather languishing condition, notwithstanding the efforts which some directors of works begin to make in order to open out new markets. Notwithstanding the low rates current for all products, orders do not come to hand at all freely. Belgian iron may, meanwhile, be procured at 7l. per ton, and even upon lower terms in the case of important contracts; steel rails are quoted at only 9l. 12s. to 10l. per ton at the works. With such prices as these Belgian iron and steel producing companies cannot expect to distribute very large dividends this year. Several contracts of more or less importance are about to be let for railway matériel—May 8, rails for the Breslau and Warsaw; May 12, carriages and trucks for the Berlin and Stettin; May 20, trucks for the Royal Wurtemberg; May 24, trucks for the Central Netherlands, &c. The Belgian Government proposes shortly, it is understood, to also give out an order for 100 or 200 trucks for the Belgian State lines. A royal Belgian decree appoints a Commission to enquire into the various tariffs in force for the conveyance of goods on railways in Belgium, and to report upon any change which it may be advisable to make in these tariffs. The director of the Belgian Lion Company has published an intimation to the effect that the company's works have only been stopped in order that a new engine of 150-horse power may be erected in them. Official returns which have just appeared show that during March, 1874, minerals were imported into Belgium to the extent of 77,114 tons, or 15,780 tons more than during March, 1874. Pig and cast-iron were imported into Belgium in March to the extent of 19,429 tons. In the course of March Belgium exported 15,356 tons of minerals, 1580 tons of pig, 5790 tons of rails, 2117 tons of plates, 8506 tons of miscellaneous iron, 1447 tons of nails, &c. The aggregate exports of iron and castings from Belgium in the first quarter of this year were about 10,000 tons less than in the corresponding quarter of 1874, and 7000 tons less than in the corresponding quarter of 1873. The Belgian Collieries Company will pay, May 1, its first dividend for 1874, or 1l. per share, or 5 per cent. per annum. The Vieille-Montagne Zinc Mines and Foundries Company will pay a dividend of 8s. per tenth share for 1874; half this dividend is payable May 10, and the remaining half Nov. 10.

Quotations for coal have remained at nearly the same level in Belgium. The sugarworks, it is observed, are beginning to conclude their contracts for the ensuing season. Belgian coalowners will, however, shortly have to follow the example of their English and German neighbours, and make a sensible reduction in wages. Gas coal is now obtainable in the basin of the Ruhr at 10s. 6d. to 11s. 3d. per ton. Most of the Belgian canals will shortly be closed for the summer. The imports of coal into Belgium in March are officially returned at 51,370 tons, of which 22,024 tons came from England, and 10,539 tons from the basin of the Ruhr. The imports of March this year presents an augmentation of 23,233 tons, as compared with those of March, 1874. During the first quarter of this year 157,140 tons of foreign coal were imported into Belgium, showing an increase of 67,730 tons, as compared with the first quarter of 1874, and about 52,000 tons as compared with the first quarter of 1873. The exports of coal from Belgium in March attained a total of 315,343 tons, of which 310,498 tons went to France. The exports for the first quarter of this year presented an augmentation of 178,400 tons, as compared with the corresponding period of 1874, but a diminution of 151,000 tons, as compared with the corresponding period of 1873. What is most striking in these returns is the rapid increase observable in the imports of foreign coal into Belgium. A strike which had prevailed for some time in the Charleroi district has terminated.

THE COAL PRODUCTION OF THE UNITED STATES.—The annual edition of the Statistics of the Coal Trade—that giving the production for 1874—prepared by Mr. Benj. Bannan, of the *Miners' Journal*, Pottsville, has just been issued, and shows that in 1874 the quantity of anthracite coal sent to market from Schuylkill, Northumberland, Columbia, Dauphin, Wyoming, and Lehigh was 15,537,888 tons, against 16,644,333 tons in the preceding year—the decrease consequently being 1,066,775 tons. The consumption within the coal field was 2,978,360 tons in 1874, against 3,245,000 tons in 1873; and the total production of anthracite was 21,516,248 tons in 1874, against 22,849,663 tons in the preceding year, showing a decrease of 1,333,415 tons. The total bituminous coal produced was 19,907,699 tons in 1874, against 22,100,769 tons in 1873, showing a decrease of 2,193,070 tons. A careful estimate shows the decrease in all kinds to have been about three and a half million tons. Subjoined is a summary of the coal production in the different countries, with number of inhabitants, and date of last returns issued:—

England.....	Inhabitants	32,000,000	1873	Tons	128,680,131
Germany.....		41,038,139	1872		42,324,471
United States.....		40,000,000	1874		41,423,947
Belgium.....		5,100,000	1873		16,658,948
France.....		37,000,000	1873		16,500,000
Austria.....		35,994,435	1872		10,861,575
Russia.....		82,172,022	1872		1,097,832
Australia.....		1,958,650	1872		942,510
Other countries.....		260,810,950	1872		2,943,650
Total.....		539,810,226			261,433,064

The iron production of the United States was—of iron rails, 761,062 tons in 1873, against 905,930 tons in 1872; of Bessemer steel rails, 129,015 tons in 1873, against 94,070 tons in 1872; of other rolled iron, including nails, 1,076,398 tons in 1873, against 941,992 tons in 1872; of blooms from ore and pig iron, 42,564 tons, against 58,000 tons; of Bessemer steel, merchantable, 157,000 tons, against 110,500 tons; of all other kinds of steel, 50,000 tons, against 38,000 tons; and of pig iron, 2,848,278 tons in 1873, against 2,854,558 tons in the preceding year. About 4000 tons of spiegeleisen was produced. The volume is full of information, and very interesting.

ALLEGED NEW GOLD DISCOVERIES.—The New York correspondent of the *Globe* writes: "Another gold mania has set in here. The tempting discovery is said to have been made in the Black Hills in the 'Far West,' a territory handed over by treaty with the American Government to the Sioux Indians. The rush towards the coveted region is at the moment, creating considerable excitement."

IRON AND STEEL.—Mr. A. BARCLAY, of Kilmarnock, has patented some improvements in the manufacture of iron and steel, and in furnaces and apparatus connected therewith. The improvements consist in placing a valve or closing over the tunnel head or chimney of open top furnaces, and leading a flue directly away from underneath the said valve on the tunnel head, or from a short distance below the top of the tunnel head or chimney, through which flue the flame arising from the combustion of the gases generated in the furnace passes off to heat the steam-boilers or to heat the ovens used for heating the blast of the furnaces. The flues for conducting the flame to the heating ovens or steam-boilers may be lined with asbestos or other non-conducting material to prevent the waste of heat by radiation; or annular flue with intervening radial openings into the throat may be made to surround the throat between the charging doorways and the level of the charge in the furnace, from which annular flue another flue or flues may be taken for conveying the flame to the ovens and boilers. The improvements also consist of forming a casing round about the air vessel or tube used for conducting the air from the blowing cylinder to the stoves or furnace, into which casing the exhaust steam from the engine is made to enter for the purpose of heating the air in the tube and separating it from atmospheric moisture previous to its entering the furnace; or in lieu of using steam a portion of the flame coming from the furnace through the flues hereinbefore mentioned may be directed through the said casing.



## Meetings of Public Companies.

## UNITED MEXICAN MINING COMPANY.

The half-yearly and an extraordinary general meeting of shareholders was held at the offices, Great Winchester-street Buildings, on Wednesday, Mr. WESTON occupied the chair, in the absence, through indisposition, of Mr. C. Morris, Chairman of the company.

Mr. W. M. BROWNE (the secretary) read the notice convening the meeting.

The report of the directors stated that the accounts of the old concern are more favourable than those of the preceding year, the excess of outlay being £4089. In the new concern more work in the aggregate has been done, in compliance with the wishes expressed by the proprietors at the two last meetings; and the outlay has amounted to \$30,404, of which \$9945 having been paid by the original owners, the company's outlay has been reduced to \$20,459. On March 24, the date of the last letter from the commissioner, his available funds amounted to \$3145, and the value of the ore under reduction on Feb. 27 was \$12,957. The directors, now acting in conformity with the wishes expressed by the proprietors at the last two meetings, which accord entirely with their own views, have given instructions to the commissioner to press work forward as much as possible, and have to ask the proprietors to sanction a further call of 2s. 6d. per share, payable on June 1.

The CHAIRMAN, in moving the adoption of the report and accounts, expressed his regret that Mr. Morris was unable to be present. The report was so full and detailed that he should be taking up the time of the shareholders unnecessarily by making any lengthened comments. All he could state was that the directors considered everything was going on satisfactorily and favourably; certainly there was no great bonanza, and no other great cause of rejoicing to look forward to; but, at the same time, everything looked favourable. They were working economically in the Jesus Maria Mine; that mine had given a great deal of money from time to time, and was now yielding something, although not much. Of course, mining was not a thing which they could rely upon, and say they would find ore here to-day, and there to-morrow; it was naturally a speculation, and, therefore, they must be prepared for the ups and downs of such a speculation. As regarded the new concerns, they were working favourably, in the hope that before long they would be amply paid for their trouble and the money which they had spent there. There was no doubt that what was called the new concern was looked upon in a very favourable light by all their neighbours around them in Mexico, and it would be very hard if the shareholders did not reap some results from their operations. If the directors had nothing very cheering to tell the shareholders, at any rate they had nothing desponding. The directors freely told the shareholders everything which took place; there was no concealment, and, in fact, some of the shareholders received information before the directors did. (A laugh.) At all events, as soon as the information came to the office the secretary laid it before the shareholders, and the shareholders knew just as much as the directors, who were carrying on the company, if not very lucratively, at any rate honestly, and that would be the case as long as he and his colleagues sat on that side of the table. (Cheers.) He moved the adoption of the report and accounts.

A SHAREHOLDER asked whether the workings were approaching the Mine of Maximora, the neighbouring mine, which was producing large quantities of fair quality ore?

Mr. C. J. FURBER said the Maximora Mine was known to be the best mine in the neighbourhood, and large quantities of good ore had been worked from it, and he understood that there were now 30,000 loads of ore stacked in the mine. That mine adjoined this company's property, but some considerable time would be required before the workings touched the Maximora Mine; the idea was to drive an adit, of which they had already driven 1700 yards, and there were about 300 yards more to drive, but when that was driven they hoped to open up the ground immediately adjoining the Maximora Mine.

Mr. S. HERAPATH asked whether the adit now being driven did not provide complete drainage?—Mr. FURBER said it did.

A SHAREHOLDER thought that the information which had been laid before the shareholders was satisfactory. There was one point in the report, however, to which he would like to call attention, and that was the amount of \$500, arrears of calls upon the last call.

The CHAIRMAN said that amount was now reduced to 119l. 2s. 6d., on the call previous to that the arrears were 20l., and on the next previous one to 7l.

A short discussion ensued as to the mode in which the accounts were audited, and the question was raised whether the accounts could not be audited in Mexico as well as in London, but it was pointed out that in all similar companies carrying on operations in foreign countries they must take the accounts coming from abroad as correct.

Mr. S. HERAPATH said he was sure the shareholders were all fully satisfied with the manner in which the accounts were audited in this country. He also believed he expressed the general feeling of the shareholders when he said that they were perfectly satisfied with the general management of the company. He had great pleasure in taking the present opportunity of expressing his confidence in the directors. (Cheers.)

Mr. FURBER, in answer to a further question, said they could not do a further great amount of work till the adit was completed. He might mention that he had had an experience of nearly 30 years in Mexico, and had been manager for four years at this company's mine, and he could safely say that there were no accounts which were submitted to a more rigid scrutiny than those of this company.

A SHAREHOLDER asked whether the claim of \$40,000 on the Mexican Government was worth anything as an asset?

Mr. FURBER said the amount was not only acknowledged by the Mexican Government, but at one time it was being paid by instalments by order upon the Custom House, but in 1859 the then President stopped the payment. The claim was larger now than when the payment was stopped, as interest had accrued in the meantime. The matter was mentioned at a meeting three years ago, just after the directors had written to Mexico on the subject. The directors were anxious to get the money, but they were advised by persons acquainted with matters in Mexico that it was better not to press the matter just at present.

Mr. GOLDSMID seconded the resolution, which was put to the meeting and carried.

On the motion of the CHAIRMAN, seconded by a SHAREHOLDER, Mr. Charles Morris was re-elected a director.

On the motion of Mr. HARRIS, seconded by a SHAREHOLDER, Mr. John Weston was re-elected a director.

The auditors, Mr. Wm. Turquand and Mr. J. Carter, were re-appointed.

The meeting was then made special, and the CHAIRMAN proposed that a call of 2s. 6d. per share be made on all the shares of the company, to be payable on and after June 1 next. It would be remembered that at the last meeting it was suggested that a 5s. call should then be made, but after some discussion it was resolved to make a call of 2s. 6d. then, and leave the other 2s. 6d. to be called later on. It was this other 2s. 6d. which was now proposed to be called.—A SHAREHOLDER seconded the resolution.

One or two shareholders expressed their satisfaction with the mode in which the directors were treating the matter of call.

The resolution was then put, and carried unanimously.

A vote of thanks to the Chairman and directors closed the proceedings.

## GORSIEDD AND MERLLYN CONSOLS MINING COMPANY.

The statutory meeting of shareholders was held at the offices of the company, Great St. Helen's, Bishopsgate, on Tuesday, Mr. FRANCIS RUDALL, jun., in the chair.

Mr. E. J. BARTLETT (the secretary) read the notice convening the meeting, also the reports, as follows:—

Your directors have to report that since the formation of this company to take over the liabilities and assets of the old important progress has been at the works, more especially in driving upon the Gorsedd lode west towards the lately acquired new land. The agent's report, however, will explain the position of the underground workings. Over 6000 shares have been taken up by holders of certificates in the late Gorsedd and Celyn Level Company, leaving 1444 in reserve, to be issued for the purposes of the mine should additional funds be required. In conclusion, your directors can express unabated confidence in the success of the undertaking, and as the land lately secured can be explored by means of the present western driving to a considerable extent early and satisfactory results may be looked for.

May 3.—Since the formation of the new company we have continued the driving of the adit east from Gorsedd uninterrupted, with eight men, and are now but a short distance from the point where the course of ore was lost some 30 yards above—in the 60 yard level—so that there is every probability of entering on a good deposit very soon, the vein in the last 20 yards driven having taken a different course—now running in nearly the same direction as the Merilyn vein—and, should it so continue, the vein (Gorsedd) will soon get into the point where it has all along been thought to exist. At present it is looking very promising, containing a good mixture of ore both in the shale and spar, but not sufficient to pay for working. In the driving north, below the road, we have not yet intersected the Merilyn vein, and should this operation not be carried out this week it is our intention to discontinue the driving here, and put the men to work in Lady Fielding's shaft in the new sett, where the water is expected to be out this week. It is just possible that the Merilyn vein, which we have been expecting to intersect in the driving north, below the road, might have been carried along with the Gorsedd vein to the vein to the point where it has changed its course, some 30 yards from our present forefront; if so, we have every reason to expect a run of ore as soon as the ground in the present driving is more like the Merilyn than the Gorsedd vein. The adit west, towards Merilyn, has also been driven by eight men, and we are now within 40 yards of the new sett, the ground at present being rather unfavourable for progress, but, according to the driving in the 60 yard level above, there should be an improvement soon. We have also opened and walled the Merilyn engine-shaft, and on exploring it this afternoon the water was found to have receded below the 50 yard level. The Lady Fielding shaft is also nearly dry to the 60 yard level, there being but 1 ft. of water there this morning; operations will be commenced at both these pits as soon as clear, when we hope to find good deposits of mineral. Two men have been on tribute at the quarry, and have raised 3 tons of ore, at 6d. per ton, which will leave us some profit, and as this place is now getting dry we shall commence to sink a pump to prove the vein in the limestone below.—WM. PARRY.

The CHAIRMAN stated that the meeting was called to comply with the Joint-Stock Companies Acts. From the report it would be seen that great progress was being made in driving the main levels, and he believed the results would be very satisfactory. At the Quarry vein they hoped soon to employ a good force;

and as the shallow and limited workings had resulted so well, there was every reason to expect great riches in depth.

A vote of thanks to the executive terminated the proceedings.

## ROOKHOPE VALLEY MINING COMPANY.

A general meeting of shareholders was held at the offices, Austin-friars, on Tuesday, Mr. R. WILSON in the chair.

The notice convening the meeting was read, and the minutes of the last were confirmed.

The accounts, made up to February, showed a balance of liabilities over assets of 487l. 18s. 6d.; and made up to the present time the assets were 304l. and the liabilities 1299l. (including the cost-sheet due this week and the ore sold last week). From May, 1874, to February, 1875, 101 tons of lead were sold, at an average of 12l. 13s. 1d. per ton, realising 1278l. 2s. 6d. From February, 1874, to January 1875, the cost amounted to 5760l. 14s. 6d.

The report of the directors was read, as follows:—

1.—The directors regret that they cannot present to the shareholders a more favourable report, but they trust that the considerably improved appearance of the mine, reported by the agents, will soon lead to more successful results. Difficulties with regard to the machinery and other surface arrangements appear to have interfered with the anticipated good returns and profits more than the want of ore. It is also satisfactory to notice that labour is now more plentiful, and, consequently, cheaper, in the district than it has been for years.

2.—On the urgent request of several large shareholders, the directors appointed Mr. James Blenkiron, of Arkendale, superintending and inspecting agent, in February last, and as he will be present at this meeting the shareholders will have an opportunity of hearing fully from him his opinion of the prospects of the mine.

3.—From the balance sheet which has been circulated, it will be seen that money is required to carry on the mine, and on this point Mr. Blenkiron lately wrote, "If funds can be raised to carry on the mine a few months longer, without disposing of any of the property, I hope we shall soon get the concern to be self-supporting." Some of the largest shareholders having met and considered the matter, have sent a request to the directors to borrow a sum not exceeding 4000l., on the security of the plant, machinery, and all other assets of the company, at interest at the rate of 10 per cent. per annum, to be cumulative, and to be a first lien on the profits of the company. The gentlemen who have proposed these terms have agreed to subscribe 1000l. provided at least 2000l. is subscribed for. The directors confidently appeal to the general body of shareholders to come forward promptly to supply the amount.

4.—In accordance with the Articles of Association, Mr. Wm. Greame, one of the directors, retired, but is eligible for re-election.

5.—The accounts have been audited by Messrs. Brandt, Standfield, and Co., public accountants, and it will be necessary at this meeting to appoint an auditor or auditors for the ensuing year.

The report of the agent was read, as follows:—

April 27.—I beg to hand you my monthly report of the above mines, which I visited last week. The 42 east is a little easier to drive, and looking considerably better for lead ore than last month; set to drive at 80s. per fathom, to six men (instead of four), as was in this forecast pushing on as fast as possible, worth 24 cwt. of ore per fathom. The rise from the 42, to meet No. 2 winze, has been very hard this last month, and the ventilation bad; we have set the men to drive west, to meet the drift on back of the 42. We have about 10 fms. to drive, which will thoroughly ventilate the ground, and lay it open for stoping; set at 4l. per fathom. Four men are stoping in back of the 25, close to eastern boundary, at 30s. per fathom, worth 20 cwt. of ore per fathom. Two men are driving the adit level east, where there are about 40 fms. of whole ground unworked; set to drive at 48s. per fm. There is a rise up already about 5 fms. above the 15, close to the eastern boundary, we purpose driving the adit forwards, and making a communication between the same and the 15, and stopping all the ground away that will pay between the two levels. The general appearance of the mine is considerably better than last month, especially in the 42. In the main forehead there are indications of a small branch or feeder coming up from the north side, which we hope will further improve the main lode. There will be 20 tons of lead ore ready for market this week. We are short of water for dressing, the mine not giving water to keep the engine going one-third of its time. If the mine is to do any good we must have men to keep the dressing floor constantly going; there have been several applications for work last month. If you have any communications to make previous to the general meeting, please let them arrive not later than Thursday, as I leave home on that day, and may not return before the meeting.—JAMES BLINKIRON.

May 3.—The mine is looking very well indeed just now; we are in a better position than we have been in for some time past. I have just come out from underground, and the mine is looking well indeed. What we want now is a little more money to open out the mine. I did not expect, when at your meeting last year, that we should have met with the accidents we have. You must excuse me, for the post is waiting.—D. B.

The CHAIRMAN was sorry to say—as had been seen by the directors' report and balance-sheet—that the company was not in that prosperous condition which at the last meeting it was expected they would be upon the present occasion; and by the agent, who indicated that before the year was out they might perhaps have had dividends. The machinery had not been erected in the short time computed, and in changing the pitwork an accident had occurred to one of the pumps, causing a delay of one month. After that came the drought, by which operations were almost suspended; then came the frost, so that if the men had been employed in the mine the ore brought to surface could not have been dressed; then the water got into the mine, in consequence of a breakage of the machinery, by which fully a month was lost in clearing out the level and getting out the debris. The directors had lately appointed Mr. Blenkiron as general superintendent, and from his report it would be seen that the mine is now in better condition than it had been for some time past. The great question to be considered to-day, however, was one of funds; the directors had already advanced 480l. to meet the payments, and the present cost-sheet would be about met by the last ore sale. The directors in their report had mentioned that the Wolverhampton shareholders, representing upwards of 4000 shares, had consented to subscribe 1000l., provided the other shareholders made up the amount to at least 2000l., an amount believed by Mr. Blenkiron sufficient to bring the mine into a paying condition. He then moved that the report and balance-sheet be received and adopted.—Mr. WILLIAM GREAME seconded the proposition.

Mr. GREENSLID wished to know provided the funds were supplied what returns might be expected. With all due respect to the board, he could not exonerate them from the blame of having expended too much upon the surface, and too little in the mine. He was also a little dissatisfied with the Rookhope Ore; he thought when they were short of funds the money should not be frittered away in such a manner. He suggested the selection of a director of some local shareholder in whom the company had confidence, and who would be frequently able to inspect the mine. He saw that from March, 1872, 22,000l. had been expended, and they knew with what results. Last year they had very great promises of dividend; but he did not place much dependence in them, although he did not expect the funds would have been exhausted and such a small quantity of ore returned.

Mr. BLINKIRON, in reply to a question from Mr. GREENSLID as to what would be the probable return by the expenditure of 2000l. or 3000l., stated that there would be no difficulty whatever in getting 50 tons of ore per month to begin with—that is, with the present prospects.

The CHAIRMAN enquired what amount of additional cost that would entail?

Mr. BLINKIRON said there would be very little additional cost. He was calculating for the driving of the 42 east, and laying ground open for stoping in that level, and also in the 25. The ground in the deeper level was considerably better than in the ground above. The work of the 42 was the part they might expect permanent returns from. The average of the lode was about 25 cwt. per fathom in the upper workings, but in the 42 the ground was considerably easier to drive.

The CHAIRMAN enquired the capacity of the present dressing machinery?

Mr. BLINKIRON said it was capable of dressing 100 tons of lead per month.

The CHAIRMAN said with regard to so much money having been spent on surface, it was necessary to mention that when Captain Rogers was appointed he reported that by means of certain machinery he would be able to double the returns, and in accordance with that report the whole of the dressing-floors was altered, and the machinery erected.

Mr. GREAME enquired how long it would take to drive the 42 up to the boundary?

Mr. BLINKIRON said it was a distance of about 195 fathoms, and would be driven by six men at the rate of 6 fathoms per month; by employing a number of men they could get ore enough to keep the dressing machinery going.

Mr. STANDING asked if sufficient ore could now be raised to pay the expenses of the mine?

Mr. BLINKIRON said not without the expenditure of the money now proposed to be raised. It would be able to return 50 tons per month as soon as the ground had been sufficiently laid open, and that would be within six months; in the meantime they would be raising and dressing ore; indeed, that could be done at once, provided there was sufficient water. From what he could see of the old workings his opinion was that the vein had not been cut through in all these levels, and that the latter had been driven in the centre in the "lead" of the vein, leaving the "cheeks" on either side. His opinion was that the "lead" was one side or the other, and that had been proved the case in a neighbouring mine. He believed there was as much ore to be got as had been taken away, and that if the mine had been worked economically, and in a miner-like manner, the company would never have been in its present difficulties.

Mr. HILL imagined from that remark that the mine had not been worked properly.—Mr. BLINKIRON was bound to say that it had been worked neither economically nor in a miner-like manner.

Mr. HILL was much disappointed at the present position of the company. He purchased his shares upon the report of Capt. A. Waters, who stated that there was ample machinery on the mine; the first thing the directors did was to pull down all the machinery, and erect new. Either Capt. Waters was wrong, or the machinery erected was not economical, and the mine had been improperly worked. As to the directors, he did not want them to work for nothing; on the contrary, he should like to see them reasonably paid, but thought, under the circumstances, that 50l. per annum each should be accepted by the board.

The CHAIRMAN said the directors had already placed a minute on the books that they would take only one-half the amount provided by the Articles of Association, and that the London manager had also agreed to take one-half salary until the mine had been brought into a paying state. The remuneration to the directors under the Articles was 500l.

Mr. HILL considered the shareholders were entitled to some explanation as to the reason that directly the capital had been subscribed upon Capt. Waters' report someone had been appointed to alter everything.

The CHAIRMAN said the mistake had been the appointment of an agent used to Cornish machinery. Upon his appointment he stated the returns could be largely increased by the application of new machinery.

Mr. HILL said that under those circumstances the directors had ignored Capt. Waters' report, in which it was stated the machinery was ample for all purposes, and to accept in future 50l. each per annum, provided the additional capital was raised in the manner suggested by the Wolverhampton shareholders, and referred to in the directors' report. (Hear, hear.) As to the donation of 10l. 10s. to the Rookhope Church, that had been voted in the previous year's accounts, and agreed to by the shareholders at the last general meeting.

The report and accounts were received and adopted.

Some discussion arose as to the advisability of appointing Mr. Whitwell (who holds 250 shares) a local director. It appeared that Mr. Whitwell was the managing director of a very successful mine in the neighbourhood.

Upon the proposition of Mr. GREENSLID, seconded by Mr. STANDING, it was unanimously resolved that the directors be requested to borrow a sum not exceeding 4000l., on the security of the company's property, at the rate of 10 per cent. to be cumulative, and to be the first lien on the profits of the company.

Mr. W. Greame was re-elected director.

Messrs. Brandt, Standfield, and Co. were re-appointed auditors.

A vote of thanks to the Chairman and directors closed the proceedings.

## SPANISH HEMATITE IRON COMPANY.

An extraordinary general meeting was held at the office, Clements-lane, Lombard-street, on Wednesday, for the following purposes:—

To consider a proposal made by or on behalf of the Bidasoa Iron Company (Limited), by reference to a draft agreement, a copy of which will be produced at the meeting, and which provided in substance, and in manner therein appearing, for the acquisition through the medium of the provisions of the 181st section of the Companies Act, 1862, of the railway, mines, and assets of the Spanish Hematite Iron Company, purchasable by them for a consideration, payable in shares of the said Bidasoa Iron Company, the last mentioned company undertaking and paying to the extent in the agreement mentioned, the liabilities of the Spanish Hematite Iron Company, and the expenses of winding-up the same, and to resolve on the acceptance or refusal of the said offer, or on the expediency for obtaining any other modification of the same. In case it should be resolved to accept the said offer, then to pass resolutions to be thereafter confirmed as special resolutions for winding up the said Spanish Hematite Iron Company voluntarily, and appointing a liquidator, and giving him sanction and authority to sign the draft agreement above referred to, and to carry into effect the arrangement thereby contemplated.

Mr. M. J. POWER in the chair.

Mr. WOODBINE CLOETE (the secretary) read the notice convening the meeting.

The report of the directors stated that in requesting attention to the terms of the notice of meeting, and the subject matters to be then considered and decided upon, the directors desire to report the progress of the negotiations for the sale of the company's assets, which was discussed at the general meeting on March 6. The committee of shareholders nominated upon that day to assist the board in this crisis of the company's affairs have not accepted the duty implied in the resolution appointing them, and in consequence the directors have been left to the alternative of eliciting, as far as possible from them, their views upon the proposition now before this company for its transfer to or fusion with the Bidasoa Iron Company. The result is to be found in the step now taken for summoning an extraordinary general meeting of the shareholders, to adopt the preliminary measures for giving effect to the proposed amalgamation.

A perusal of the reports of the Bidasoa Iron Company will enable the shareholders to form a judgment upon the expediency of amalgamating with that company, and though the directors are still unchanged in opinion of the superior relative value of the Spanish Hematite Iron Company's mineral property, yet, under all the circumstances of the case, including the impossibility of this company obtaining of itself sufficient additional capital to complete its works, the fusion of the two companies offers the only practicable means open to the directors for securing to the Spanish Hematite Iron Company's shareholders a return for their outlay. The terms upon which the shareholders will be asked to approve of the sale or transfer of their interest in the Spanish Hematite Iron Company will provide for the payment by the Bidasoa Company of the liabilities of this company, and will secure to the shareholders of this company an equivalent amount of fully paid-up stock in the capital of the Bidasoa Iron Company. The proposed fusion will likewise have the effect of terminating all questions regarding the royalties and the Three Crowns Mine, as the Bidasoa Iron Company will engage to settle all claims in that respect by the payment of 3000l. to the lessors. There is, however, in return an important condition which the Bidasoa Iron Company insists upon as absolutely indispensable to their completing the acceptance of the transfer—that is, as an equivalent for the liabilities of the Spanish Hematite Iron Company to be undertaken by them, the shareholders shall subscribe in the united company an amount equal to 10 per cent. upon their present holdings, to be called up, and as circumstances may require. The directors have effected a modification in this latter article by inducing the Bidasoa Company to substitute debentures bearing 6 per cent., and re-payable in five years, for the proposed amount of stock to be subscribed mentioned therein. It will, therefore, be optional with the subscribing shareholders to take either stock or debentures, as each feel disposed.

The directors have appealed to their own friends, and having already secured subscriptions in shares or debentures to the extent of 2800l., feel themselves justified in now convening the general meeting for the purpose of deciding whether the proposed arrangement is to be carried through or not. The directors cannot too strongly impress upon each shareholder the importance of his attention and support in the present juncture. They urge upon everyone whose engagements will permit the advisability of attending the meeting in person, and those who are prevented from doing so are urged to be present by proxy; and as merely voting for the arrangement without providing a subscription for shares or debentures commensurate with the holding in shares in this company will not ensure the project being carried out, every shareholder who cannot attend is requested to return the enclosed subscription paper, filled up with a subscription in shares or debentures not less than 10 per cent. of his holding.

The CHAIRMAN: There is but little information on the affairs of the company to add to that contained in the circular sent out to each shareholder accompanying the notice convening this meeting, but I shall be happy to hear, and to the best of my ability to answer, any question on the subject which may be addressed to me by any gentleman present. That the proposed transfer of the assets of the company to the Bidasoa Iron Company for the consideration and on the terms set forth in the preliminary agreement, has been received with favour generally by the shareholders may be gathered from the fact that our co-proprietors, including myself and some of my colleagues, have already subscribed upwards of 3000l. towards the 10 per cent. subscription required by the Bidasoa Iron Company, and unless there can be found an alternative offering superior or even equal inducements and advantages to this company, I cannot see why we should hesitate, in the interest of all concerned, to give effect to the resolutions which will be submitted to you at this meeting. Before proposing the resolutions in detail, the purport of which is already before you in the notice just read, I await the pleasure of the meeting should information be required from me upon any point which, in the opinion of any shareholder, may require elucidation.

Gen. BURN (a director) added that the position of the shareholders would not be altered.—The CHAIRMAN said the Spanish Hematite shares were fully paid up, as were the shares of the Bidasoa Company; each Spanish Hematite shareholder would become a shareholder in a company with funds, instead of as now, in a company whose funds were exhausted. The property would slip through the fingers of the Spanish Hematite Company unless the course now proposed were adopted. There was a pressing claim for 5000l. against the Spanish Hematite Company.

Mr. CORNWELL drew attention to the fact that the Bidasoa Company had an uncalled capital of 10l. per share.

The CHAIRMAN said that was a source of strength, and the larger the amount the better.

Mr. CORNWELL understood it was intended to expend 40,000l. in smelting-works.

The CHAIRMAN said that was a contingency that might not arise.

Mr. CLOETE said the Bidasoa Company was by no means in an impecunious condition—on the contrary, they had a considerable reserve and a small sum in advance, which was quite enough to carry them on; and, moreover, they were paying their way. The Bidasoa Company took over the Spanish Hematite Company at par; nothing could be fairer, for the shares were most certainly not at par, while they had the chance of receiving dividends, which he had very little doubt they would do.

The CHAIRMAN said if the railway had been completed the shareholders would soon see a rapid development of their property, as there was no deficiency of ore.

Mr. CLOETE said the Bidasoa Mines, according to the captains' report, were quite equal in value with the Three Crowns, and already a large portion of their tramway had been completed, almost to the point of delivery. The 10l. per share up-called was the strength of the concern—another great advantage from the amalgamation would be that the shares, if ever brought upon the market, would be quoted at some sort of value. Besides this, they would get over the question of title and royalties. It seemed to him, looking at the two companies, that the shares would not be worth the paper they were written on if this amalgamation was not carried out.

The CHAIRMAN said his colleagues and himself had come forward and subscribed 10 per cent. upon their present holdings. He then proposed that this meeting having heard read a draft agreement submitted for the consideration of the directors of this company the Bidasoa Iron Company (Limited), the arrangement identified by the signature of the Chairman, now present, hereby requested to the shareholders contemplated by the said draft agreement is one beneficial to the Spanish Hematite Iron Company, and should be carried into effect.

General BURN seconded the proposition, which was put and carried unanimously. In order to effectuate the last resolution, this meeting by this as a special resolution requires the Spanish Hematite Iron Company to be wound-up voluntarily, and appoint Mr. Charles Barrett, of 15, Finsbury-place South, liquidator.

Mr. ALEXANDER (a director), as the largest creditor of the company, and a large shareholder, seconded the proposition. He hoped and believed the course now being adopted would be the means of getting them out of their difficulties.—The resolution was put and carried unanimously.

The CHAIRMAN then proposed that this meeting by this as a further special resolution sanctions and authorises the liquidator to sign the above-mentioned agreement, and to carry into effect the arrangement thereby contemplated.

Mr. CORNWELL seconded the proposition, which was put and carried unanimously. The CHAIRMAN then proposed that the remuneration of the liquidator be 100l., including the law costs, except the cost of transfer, but not including contentious proceedings.—Mr. CLOETE seconded the proposition, which was put, and carried.

The CHAIRMAN then proposed that the directors, liquidator, and all other necessary parties (if any) be, and that they are hereby, authorised and required forthwith to take all steps in their judgment necessary or proper for carrying into effect the foregoing resolutions.—Mr. VANDERBYL seconded the resolution, which was put, and carried.

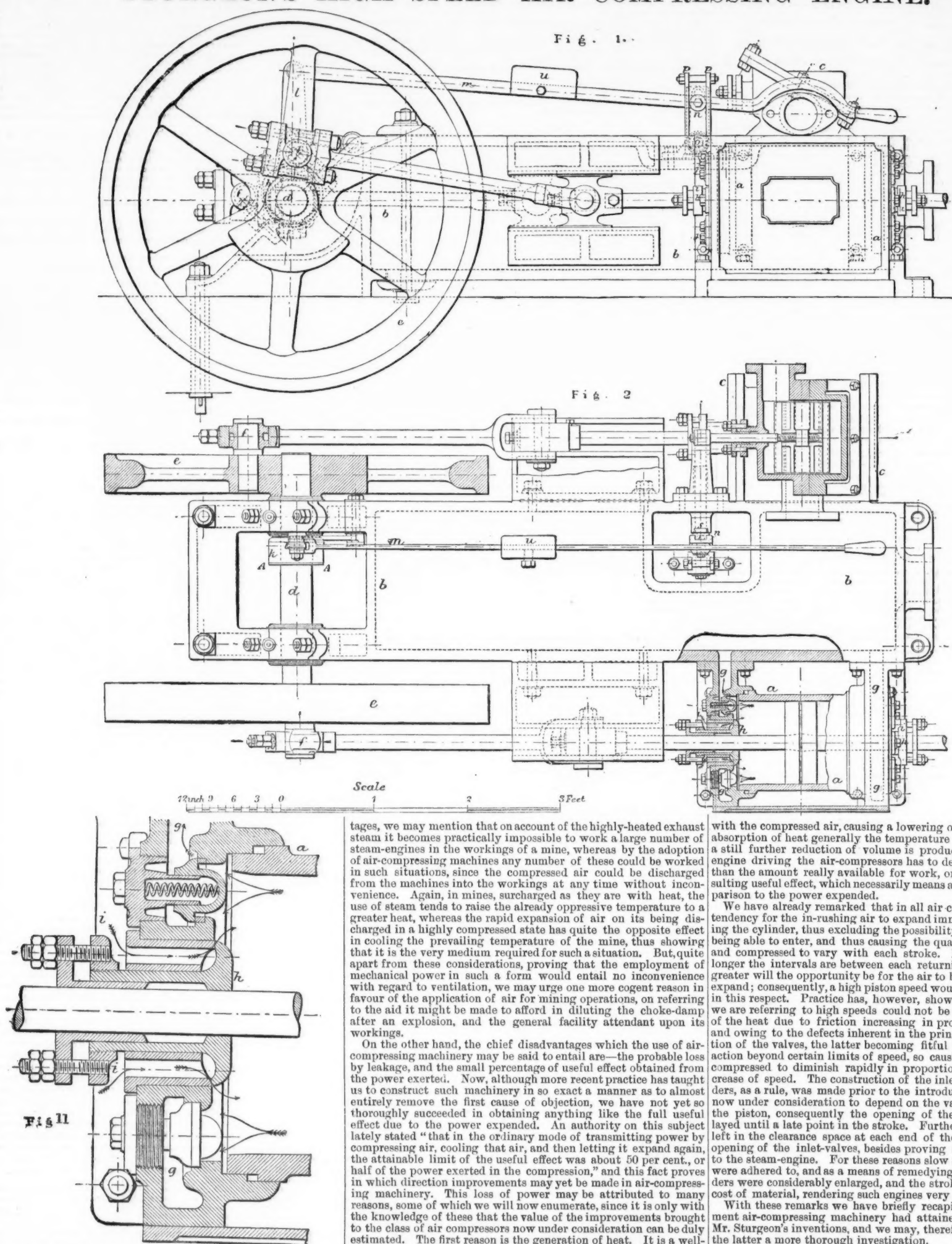
A SHAREHOLDER asked under what name would the united companies be worked?







## STURGEON'S HIGH SPEED AIR COMPRESSING ENGINE.



STURGEON'S HIGH-SPEED AIR-COMPRESSING ENGINE.

We illustrate herewith Sturgeon's High-Speed Air-Compressor, which will unquestionably recommend itself to the attention of the mining public in general. To understand the improvements which Mr. Sturgeon has introduced in the present type of engine, we shall have to refer briefly to the gradual development the application of air-power had attained up to the time of the present invention. Although the idea to employ an elastic medium, such as our atmosphere, for a motive power belongs to our first mechanical philosophers, still it is but within recent years that the first step of any importance was taken in this direction. Indeed, this first important application of machinery for superseding animal labour in underground operations where steam could not be used direct, or long steam-pipes became objectionable, and thorough ventilation was an imperative necessity, has been stated at so recent a period as the year 1857, corresponding to the boring of the Mont Cenis tunnel. Be this as it may, so much is certain that the introduction and present improved constructions of air-compressing machinery is due to the rapid development the mining engineering branch has attained during quite recent years. The opening up of our numerous mines, and consequent larger competition in commercial markets, combined with the increasing expenses inherent to the employment of manual labour and animal power in underground operations, have exerted the most powerful influence in developing the application of air as a mechanical power in all situations where the use of steam was objectionable. Moreover, the suggestions which present themselves to the thoughtful mind on the advantages which the use of compressed air would have over the application of steam for underground working, have likewise exercised some influence in recommending the adoption of air-compressing machinery. Amongst such advantages,

we may mention that on account of the highly-heated exhaust steam it becomes practically impossible to work a large number of steam-engines in the workings of a mine, whereas by the adoption of air-compressing machines any number of these could be worked in such situations, since the compressed air could be discharged from the machines into the workings at any time without inconvenience. Again, in mines, surcharged as they are with heat, the use of steam tends to raise the already oppressive temperature to a greater heat, whereas the rapid expansion of air on its being discharged in a highly compressed state has quite the opposite effect in cooling the prevailing temperature of the mine, thus showing that it is the very medium required for such a situation. But, quite apart from these considerations, proving that the employment of mechanical power in such a form would entail no inconvenience with regard to ventilation, we may urge one more cogent reason in favour of the application of air for mining operations, on referring to the aid it might be made to afford in diluting the choke-damp after an explosion, and the general facility attendant upon its workings.

On the other hand, the chief disadvantages which the use of air-compressing machinery may be said to entail are—the probable loss by leakage, and the small percentage of useful effect obtained from the power exerted. Now, although more recent practice has taught us to construct such machinery in so exact a manner as to almost entirely remove the first cause of objection, we have not yet so thoroughly succeeded in obtaining anything like the full useful effect due to the power expended. An authority on this subject lately stated "that in the ordinary mode of transmitting power by compressing air, cooling that air, and then letting it expand again, the attainable limit of the useful effect was about 50 per cent., or half of the power exerted in the compression," and this fact proves in which direction improvements may yet be made in air-compressing machinery. This loss of power may be attributed to many reasons, some of which we will now enumerate, since it is only with the knowledge of these that the value of the improvements brought to the class of air compressors now under consideration can be duly estimated. The first reason is the generation of heat. It is a well-known fact that whenever a gas is compressed an elevation of temperature is produced, consequently as this takes place in the air-compressing cylinder, Boyle and Mariott's law, that "the elastic force of a given mass of gas varies inversely as the volume it occupies" will not hold good since the latter requires that the temperature remains constant. This heat generated expands the compressed air, so that a much larger volume has to be expelled after compression has taken place than would be the case provided the temperature had remained constant, consequently various methods have been suggested for keeping the temperature practically uniform throughout the stroke of the air-compressing cylinder. A further amount of heat is generated by reason of the particles of air rubbing against each other in their passage, and likewise through the friction caused by the air being forced out of the cylinder valves. Again, in the majority of air compressors the interior of the compressing cylinders become in time so heated up that this heat becomes immediately transferred to the air rushing in, thus causing the latter to expand rapidly, so preventing the admission of a full volume at the natural temperature and density. Introducing cold water inside the cylinder, either in the form of spray or of a jet, has been adopted for the purpose of cooling the inner cylinder surface as well as for keeping a constant temperature, and although such a method may be said to have the advantage of exposing the piston to water leakage only, still it involves a slow speed, besides being detrimental to the valves; but perhaps its greatest evil is that it does not entirely remove the heat, merely transferring it as it were. The impinging of the cold water on the inner heated surface of the cylinder produces an aqueous vapour, which through the action of the piston is forced into the receiver and carried into the pipes, where it soon condenses on account of its surplus heat being absorbed. By the condensing of this vapour a space is left, which becomes immediately filled up

with the compressed air, causing a lowering of pressure, and by the absorption of heat generally the temperature becomes reduced, and a still further reduction of volume is produced. Thus the steam-engine driving the air-compressors has to deliver a larger volume than the amount really available for work, or greater than the resulting useful effect, which necessarily means a loss of power in comparison to the power expended.

We have already remarked that in all air compressors there is a tendency for the in-rushing air to expand immediately on its entering the cylinder, thus excluding the possibility of the full quantity being able to enter, and thus causing the quantity of air drawn in and compressed to vary with each stroke. It is evident that the longer the intervals are between each returning piston stroke the greater will the opportunity be for the air to become heated, and so expand; consequently, a high piston speed would be highly beneficial in this respect. Practice has, however, shown that up to the time we are referring to high speeds could not be introduced on account of the heat due to friction increasing in proportion to the speed, and owing to the defects inherent in the principle of the construction of the valves, the latter becoming fitful and irregular in their action beyond certain limits of speed, so causing the amount of air compressed to diminish rapidly in proportion to such further increase of speed. The construction of the inlet-valves of the cylinders, as a rule, was made prior to the introduction of the machine now under consideration to depend on the vacuum formed behind the piston, consequently the opening of the inlet-valves was delayed until a late point in the stroke. Further, the compressed air left in the clearance space at each end of the stroke retarded the opening of the inlet-valves, besides proving a direct loss of effect to the steam-engine. For these reasons slow speeds in compressors were adhered to, and as a means of remedying this defect the cylinders were considerably enlarged, and the strokes lengthened, at the cost of material, rendering such engines very costly.

With these remarks we have briefly recapitulated the development air-compressing machinery had attained up to the time of Mr. Sturgeon's inventions, and we may, therefore, pass on to give the latter a more thorough investigation.

In devising the present construction Mr. Sturgeon's chief object has been to increase the percentage of useful effect obtained from the power exerted, and this he has been enabled to do by inventing a new construction of inlet-valves allowing him to run his compressor at high speeds without any danger of its valves becoming unreliable in their action, or without detriment to his machine, allowing for reasonable wear and tear. In disposing over the design of this high-speed air-compressor, Mr. Sturgeon casts the receiver and the steam-cylinder in one piece, as shown in figs. 1 and 2, representing side elevation and plan of the machine, and bolts his air-compressing cylinder (a) on the other side of the receiver (b), opposite the before-mentioned steam-cylinder (c). A fly-wheel shaft (d) is carried by two pedestals at the other end of the bed-plate or receiver (b), and this shaft has a fly-wheel (e) keyed on to each of its extremities. The crank-pins (f, f) are fixed at right angles to each other on each of these fly-wheels, and the crank-pins (f, f) are connected in the usual way to the two cylinder pistons. Now, as in the compressing cylinder, the pressure is smallest at the beginning of the stroke, and the greater portion of the work is done in the latter part of the stroke, whereas in the steam cylinder the pressure is greatest at the beginning of the stroke, and least in the end, the setting of the crank-pins at right angles to each other enables the steam-crank pin to be in its best position to meet the increasing resistance in a similar ratio. Practice has shown that by this arrangement, and with equal cylinder diameters on both sides, the air-compressor has registered at one and the same time double the steam-pressure of the other cylinder.

To meet the varying requirements of the air-driven machinery in the supply of air Mr. Sturgeon has adopted the following arrangement, by means of which the steam-engine is enabled to vary its speed automatically, so that when the air-driven machinery is



stopped the air-compressor may likewise stop of its own accord. On the fly-wheel shaft (*d*) an eccentric (*k*) is placed, which by working on to a combination of levers is made to actuate the valve of the steam-engine in such a manner as to lengthen or shorten the travel of the slide, according as the pressure in the receiver falls below or above the required extent, which will necessarily correspond to an increase or slackening of speed. A plunger (*g*) fits air-tight in a recess made in the receiver (*b*), and according as the pressure increases or diminishes so will the plunger rise or fall, carrying with it in the same direction the fulcrum (*o*) of a lever (*n*), which with it is accordingly raised or lowered in the guides (*p p*). A centre (*e*) is imparted to this lever (*n*) around its fulcrum (*o*), by its upper end being connected with the before mentioned rod (*m*). The valve lever (*s*) working from the fixed eccentric (*t*), has a projecting pin (*r*), gearing into a corresponding groove (*u*) of the lever (*n*), so that the to and fro movement of the lever (*n*) is imparted to the valve lever (*s*). From this description it is evident that the more the centre (*o*) rises the more will the travel of the valve be shortened; in other words, the less steam will be admitted into the steam cylinder, whereupon a slackening of speed must ensue, and *vice versa*. In order to regulate the pressure required in the receiver (*b*), a sliding weight (*u*) is attached to the rod (*m*), which according to the position it is set it can be made to maintain the amount of pressure desired in the receiver. When the centre of the lever (*n*) comes opposite the pin (*r*) of the lever (*s*), the movement of the latter is stopped, and the engine automatically comes to a stand-still.

In order to reduce the heating of the compressing cylinder the latter is enveloped by a cavity or tank, which is filled with supplies of cold water. As this water becomes heated it is used as feed-water for the boiler, and thus a portion of the heat generated, which otherwise proves detrimental, is turned to some advantage. The nicety with which all the working parts are counterbalanced is evident from the fact that with a speed of 220 revolutions, or 440 feet per minute, no further foundation was required than merely a few wooden logs placed underneath to keep the fly-wheels from touching the floor.

To test the action of the machine at high speed a number of diagrams have been taken, which, however, on account of want of space, we cannot here reproduce. Suffice it to say, these diagrams have conclusively proved that, independently of speed, each stroke of the air-compressor piston performed its full amount of work, since the various compression lines taken almost coincide with each other.

We have yet to describe the construction of the air-cylinder valves, which form the chief innovation in this type of air-compressors, and to do this we refer the reader to an enlarged section of one—the two are exactly similar to each other—of the covers of the air-compressing cylinder, as shown in our Fig. 2. It will be seen that the inlet is fixed in the middle of the cylinder cover, in the form of a circular ring, marked with *i i* in the wood-cut. The cylinder-piston is fitted at each end with stuffing-boxes (*h h*), which are securely packed to the piston, so as to have a frictional hold on the latter. The inner end of this stuffing-box (*h*) is made to sit close on the inner surface of the cylinder cover when the two come in contact with each other. Owing to the frictional grip which this stuffing-box has upon the piston, as the latter recedes from one end of the cylinder, the corresponding stuffing-box becomes drawn in the same direction, till its travel is checked by the stop shown in the figure coming against the outside surface of the cylinder cover, when the piston completes the remainder of its stroke independently, while the air is drawn in to the full extent of the stroke. The return of the piston brings the inlet-valve close on to its inner seating, thus preventing the air from escaping out again whilst it is being compressed. To prevent these valves from coming in violent contact on their inner seatings when working at high speeds, the crank pins are further so arranged that at the moment of contact the respective crank-pin is almost on its centre, or at its lowest speed, and the valve is thus brought gently on its facings, without violent concussions. It is further evident that the opening of such inlet-valves is altogether independent of the vacuum formed in the air-cylinder, inasmuch as they owe their actions to the driven piston. Moreover, the compressed air, which in other types of engines of this class, as we have already mentioned, proves a direct loss of power, is here turned to good account, for it prevents the valve opening until the piston has travelled sufficiently far to allow time for the delivery valves to close before the inlet-valve opens.

The delivery valves are denoted in figures 1 and 2 by *j, j*, and are distributed over the whole inner surface of the cylinder covers. These valves are in direct communication with the receiver (*b*), through the passage *g* (fig. 11), and they are further kept close to their facings, partly through a spring thrusting inwards, and partly through the back pressure exerted on them by the compressed air in the receiver (*b*). As soon as the pressure in the air cylinders, acting on their inner surfaces, becomes greater than the counter-pressure before mentioned the spring becomes compressed, or, in other words, the compressed air in the cylinder forces its way through the valve openings and the clear passage (*g*) into the receiver (*b*), to be there stored according to requirements. The back pressure on these delivery valves causes them to become closed again, and the inlet valves are ready then to open inwards. A glance at the section will show that for repairing or cleaning these delivery valves can be removed without detaching any fast joints.

If we, therefore, compare the present construction with types that had hitherto prevailed we shall find that, notwithstanding the high speed at which the present engines may be run, friction has been reduced by enlarging the delivery areas, and by preventing as much as possible cross currents of air, whereas the useful effect has been increased by the introduction of high speed, by constructing the inlet valves in such a manner as to cause them to open and shut with absolute certainty throughout the corresponding stroke; and, lastly, the outlay of the engine has not been augmented, though necessitating a larger and, therefore, more costly engine altogether.

#### DIRECT-ACTING PUMPS.

Messrs. PARKER and WESTON, of Birmingham and Coalbrookdale, have patented some improvements in direct-acting pumps worked by steam, compressed air, or water, which improvements may also be applied to motive power engines worked by steam, compressed air, or water. The invention consists in constructing and working the valves of the said pumps and engines in the following manner. Two exhaust valves, two steam valves, and two pistons are arranged on a rod working in a steam chest furnished with seats for the steam and exhaust valves. One piston, one exhaust valve, and one steam valve are arranged on either side the middle point of the rod. The exhaust valves are of greater area than the steam valves. Small ports are made in the ends of the steam chest, in addition to the steam and exhaust ports. As the piston approaches one end of the steam cylinder the small port is opened and steam is admitted to the back of the exhaust valve, and the exhaust valve at that end is thereby closed, and the steam valve opened, the exhaust valve at the other end of the steam cylinder being opened and the steam valve closed. The same action takes place when the steam-piston approaches the opposite end of the cylinder. The movement of the valve is produced by the action of the steam on the exhaust valve, the area of which is greater than that of the steam valve. Arrangements are described by which the admission of steam to the back of the exhaust valve is regulated, and for working the steam expansively, and giving any desired range of cut off.

Messrs. FORBES and HAMILTON, of Smethwick, engineers, have patented some improvements in direct-acting pumps worked by steam or compressed air. This invention relates to the valves of the steam or compressed air cylinders of the said pumps, and consists in automatically working the said valves in the following manner:—The valve consists of three parts, two short pistons at opposite ends of the steam chest, and a cylindrical hollow valve, with two ports in it, between the short pistons. By the reciprocating motion of the middle valve its ports are made alternately to convey steam to or permit of the escape of exhaust from the same end of the cylinder. Two small ports near the ends of the steam cylinder open into the steam chest, and admit steam at the proper times behind the end

piston valves. As the steam piston makes its stroke it opens one or other of the small ports, and steam entering the steam chest acts upon the end piston valve, and the latter advances the middle cylindrical valve, and reverses the position of its ports, the entering steam forcing in opposite directions the said middle valve and end valve so as to completely open both the steam and exhaust ports.

#### ANGLO-AMERICAN MINING—THE EMMA.

The action in the Supreme Court, City and County of New York, commenced by the Emma Silver Mining Company (Limited), of London, against Trenor W. Park and H. Henry Baxter, has been answered, the defendants expressly reserving the objection that the complaint does not state facts sufficient to constitute a cause of action. They admit the incorporation of the plaintiffs, and the conveyance about Feb. 13, 1871, by James M. Day and others to the Emma Mining Company of Utah of the property, as set forth in the complaint. Their knowledge of the Emma Mine commenced in March, 1871, and they visited the mine without assistance of mining engineers. They learned from the owners that the mine commenced working in July, 1870, and that between that date and March 4, 1871, there had been extracted therefrom 6025 tons of ore, which had yielded the owners a net profit of more than \$580,000, this ore being nearly all sold through Bath and Son, of London, and Lewis and Son, of Liverpool; and the defendants then believed, and still believe, that such information was true. They learned that this large product of ore had given the mine a high reputation, and was believed by all persons acquainted with it to be one of the most valuable mines of silver ore theretofore discovered, but no patent had been issued from the United States, the title having been acquired by purchase from persons claiming to have been the discoverers of the mine, and that there were a large number of adverse claimants thereto, and many suits and actions pending in which the title to said mine was involved. Messrs. Park and Baxter purchased after much negotiation one undivided half-share in the property for \$375,000, on condition that the then owners retained the other half until the title was finally settled. Mr. Park considered the property worth many times the purchase price in case a perfect title thereto could be secured. Mr. William M. Stewart had no interest therein, nor was he consulted by defendants as to the property, being, in fact, the counsel of an adverse claimant thereto.

Among the actions so pending was one in favour of James E. Lyon, which was brought on for trial in July, 1871, to defend which Messrs. Park and Baxter employed counsel. The case was referred to the late B. R. Curtis, of Boston, and at this date Mr. Park again examined the mine, and found that the production of ore had not diminished; indeed, it was generally believed that the mine would be permanent in duration, and was of the value of many millions of dollars. Mr. Stewart, as counsel for Lyon, submitted a compromise, which was at first refused, but it was subsequently agreed that Lyon should withdraw his claim, so that the United States patent might issue to the Emma Mining Company, of New York. The property was to be sold for the best price, and the then owners having been paid \$1,500,000 out of the first proceeds, Lyon was to have a certain percentage upon any surplus above that sum, such percentage not to exceed \$500,000. Shortly after Park and Baxter's purchase, and considering the peculiar and unsettled condition of the laws in Utah, the Emma Silver Mining Company, of New York, was organised and located in New York, with a capital of \$5,000,000, in shares of \$100 each. These were distributed among the owners of the mine at purchase price. T. W. Park had 12,500 shares; H. H. Baxter, 12,500; Warren Hussey, 6252½; R. B. Chisholm, 5983½; James Smith, 4166½; J. E. Walker, 1042½; Samuel S. Walker, 1041½; David F. Walker, 1041½; Nathan H. Walker, 1041½; Francis D. Clift, 1041½; Minerva N. Cunningham, 260; and James M. Day, 3125 shares. Stewart was not at that time, nor subsequently, the holder of any stock of the Emma Silver Mining Company of New York, nor had he then, nor subsequently, any interest in the property owned by said company, except as hereinafter stated. At the time the New York company was organised all the owners believed the property, when the title was secured by United States patent, to be worth \$5,000,000. As the mine had given over \$580,000 profit in 32 weeks, this was making the sale at less than 5½ years' purchase.

Mr. Baxter was Chairman of the Emma Silver Mining Company, of New York, and it was agreed that the whole or a portion of the stock should be offered in the London market. Park, representing all the stockholders, and Stewart, representing Lyon, proceeded to England in September, 1871. Immediately on Park's arrival in London he was applied to by Mr. Coates, of Coates and Hankey, who desired to purchase the Emma Mine and property. Park agreed to sell to Coates and Hankey one-half of the Emma Mine and property for 400,000 sterling, and, if the purchasers so desired, Park would unite with them in the formation of an English limited company, to which the entire mine and property should be conveyed, upon condition that the entire expense of organising such company should be borne by Coates and Hankey, and that Park and his associates should receive one-half of the stock of such English company in payment for the remaining half of said mine and mining property. Coates and Hankey were forthwith to have the mine examined, and selected for that purpose Prof. B. Silliman, of Yale College, New Haven, Connecticut. Park had never seen Silliman, did not suggest his name to Coates and Hankey, to whom Silliman reported direct. As Silliman's lectures were just about to commence at Yale he could not go to Utah unless a substitute professor were appointed, and Baxter, under instruction by telegram from Park, agreed to pay Silliman reasonable expenses and inspection fee, and also cost of substitute professor, but no communication was made to Silliman as to the terms of his examination and report, and the compensation was not in any way contingent upon the sale of the mine or the character of his report. No notice was given to any person connected with the working of the mine that an inspection was about to be made. Silliman was in fact and in law the agent of Coates and Hankey, and their principals.

In November, 1871, Coates and Hankey having informed Park that Silliman's report was satisfactory, Park claimed completion of purchase, and Coates and Hankey introduced Park to Baron Albert Grant, previously unknown to them, and Grant proceeded to organise the company, and complete purchase, Grant suggesting that Park, Baxter, and Stewart should represent the vendors, who were to retain one-half of the capital stock, on the board of directors, and Grant, Coates, and Hankey selected and named Geo. Anderson, E. Brydges Williams, E. Leigh Pemberton, Percy Doyle, the Hon. J. C. Stanley, and the Hon. Robert C. Schenck, United States Minister in London. A correct statement of all silver ores produced from the mine between July, 1870, and Sept. 1, 1871, was delivered to Grant, and before issuing any prospectus or offering stock the directors of the Emma Silver Mining Company of London (other than Park, Baxter, and Stewart) insisted that the account should be examined and verified by accountants of their own selection, and this was done before the prospectus was issued. Between Oct. 27, 1870, and May 30, 1871, Lewis and Son received from the mine and sold silver ores of the value of 78,884½, and between Oct. 29, 1870, and July 15, 1871, Bath and Son received and sold 84,770½ worth of ores, equal to about \$300,000. The same firms between April 25 and Sept. 1, 1871, sold about \$568,000; this did not include the value of silver ore then raised and sacked at the mine, or in transit, of the value of about \$243,000. All expenses incurred were likewise by the directors' accountants. There were also 359 tons, giving a profit of 10,052½, sold in Utah. Neither Park nor Baxter were consulted with regard to the prospectus; nevertheless, Park avers (and Baxter's answer differs only verbally) that "each and every statement in said prospectus contained was not only believed to be true by Park at the time the same was issued, but he had no reason to believe, nor did he believe at that time, nor does he now believe, that any fact statement or representation in said prospectus contained was in any respect false or untrue." Silliman estimated the ores accrued and ready for shipment at the mine at 2800 tons, whereas Park had estimated them to Coates and Hankey at 1750. Park, therefore, supposed he had made an error, but although Silliman's estimate was taken it was agreed that Park should make

good any deficiency. The quantity proved to be 1800 tons, and Park paid to the company \$136,000 for the deficiency. This was the only overestimate in Silliman's report, and the Emma Silver Mining Company of London has since taken from said mine many thousand tons of silver ore in excess of the quantity so estimated by Silliman. Park and Baxter aver that after they acquired their interest in the mine until it was transferred to the Emma Silver Mining Company of London it was worked diligently, and as such mines usually are, and as it had been previously, and not otherwise, and that all the statements in the complaint to the contrary thereof, and especially all the statements contained in folios 30 to 35 are wholly false and untrue. The transfer of the property from the New York to the London company was duly made, and Park acted exclusively as agent of the New York company, and was only interested as a stockholder therein, all which was known to the London company and all persons acting on their behalf.

At the date of transfer the only fact then material to the value of said mine that was not known to the plaintiffs or their said agents was the future duration of the vein or deposit of ore beyond what was at the time disclosed by the working of the same, which fact Park and Baxter aver and believe was impossible to be known or positively ascertained either by observation or by the use of any scientific research or practical experience, and the purchasers in making purchase to the risks, as the purchasers of mining property always and necessarily do. Park states that the London company continued to raise and send silver ore to market, and about Feb. 1, 1872, applied to the vendors, and requested them to offer for public subscription enough of their stock to enable the company to comply with the rules of the London Stock Exchange, but as false reports as to exhaustion of mine had been already circulated, Park declined to sell until a committee appointed by the directors had been to Utah and verified the representations upon which the sale was made. Mr. E. Brydges Williams was appointed the directors' committee, made the inspection in March, 1872, and reported the mine to be of greater value than had been represented. This was confirmed by Mr. John C. Stanley in June, 1872. Mr. Anderson reached the mine about Aug. 1, 1872, and remained about two months, employing mining experts of his own selection, and on Sept. 26, 1872, wrote to Park—"I have been through the mine, and am far more than satisfied with what I have seen. I think it quite impossible for anyone to go through without a full conviction that it is a mine of immense wealth, and that we are in possession of a splendid property."

Mr. Park avers that it is not true that the mine has given out or become exhausted; "that, although it is true that the particular deposits heretofore worked have diminished in richness and value, that such diminution is common to ore deposits in all silver mines; that in the common and ordinary method of working such mines, explorations by means of shafts, tunnels, and other excavations, for the purpose of tracing the direction of lodes, veins and masses of the ore, and of laying open and discovering new masses and deposits, are usually practised and carried on; that in the management and working of said mine the plaintiff company has been inefficient and unskilful during its possession thereof; that no such or any proper exploration has been made, or attempted to be made, in said mine during the possession of the said plaintiffs; that the mine is now, and for some time past has been, under the control and direction of officers who have failed to carry on the explorations and examinations which miners of ordinary care and prudence are accustomed to carry on in the working of mines; and this defendant insists that if such proper explorations had been carried on in said mine in conformity with the custom of prudent miners in similar mines, the product of said mine would probably be as great in quantity and rich in value as it has ever been; and he avers that but a small portion of said mine, in width, depth, or length, has yet been explored or examined; but he denies that himself or his associates have ever, in any respect, become guarantors for the value of said mine, or have ever made any statements or representations in respect to the prospective value thereof."

Messrs. Park and Baxter deny specifically each and every statement imputing to them any fraud, deceit, misrepresentation, conspiracy, concealment, artifice, or wrong in respect of any of the matters mentioned in the complaint, and ask judgment that the complaint be dismissed with costs.

[The answers were prepared by Messrs. Chittenden and Hubbard, attorneys, of Pine-street, New York, to whom we are indebted for copies, and the above is a fair abstract.—Ed. M. J.]

**SOVEREIGN LIFE ASSURANCE COMPANY.**—In presenting the 29th annual report to the proprietors, the directors of this company express pleasure in drawing attention to the accounts already issued, showing a general improvement in the funds of the company, which were increased to the extent of 40 per cent. of the premium income during the year 1874. The revenue from all sources has exceeded that of the preceding year by 3362½. There was not so very large an amount of new business, but when it is taken into consideration that during the past year the directors, secretary, and other officers have been engaged on the periodical investigation in relation to the affairs of the company, with a view to a bonus appropriation, we can easily account for the comparatively small amount of new assurances, although there are other companies much older in years than the one to which we allude whose new premium income does not exceed the amount transacted in the present instance. During the year 349 policies were issued for assurances, representing a total of 186,825½, and producing an annual premium income of 5828½ 4s. 5d. The directors recur in their report to the satisfactory statement made by Mr. Sprague, the actuary, on the general position of the company; and as that gentleman is well known to possess a thorough knowledge of assurance business in all its details, in addition to being one of the most eminent actuaries of the present day, we can safely rely upon his report, and it, therefore, affords us very great pleasure in noticing the same. Mr. Sprague in his report to the directors stated July 29, 1874, after setting forth that he had made a very careful valuation of the liabilities of the company, which was based on the tables recently published under the authority of the Institute of Actuaries, with interest at 4 per cent., was of opinion that a sum of 36,503½ might be set aside for appropriation as bonus, and he concludes his report by expressly declaring that after the thorough investigation he had made into the company's affairs he was satisfied that the company was in an undoubtedly sound condition. Such a report as that made by Mr. Sprague must be exceedingly gratifying to all concerned in the prosperity and welfare of the company, and the annual report just published is a further proof that the company is steadily progressing and advancing in popularity, and we have every reason to believe that if the company continues to be managed with that amount of skill and judgment which has hitherto marked its career at the next division of profits a much larger bonus may be looked forward to by the policy holders.

In a paper recently communicated to the Geological Society, Mr. Hicks calls attention to the occurrence of phosphates in rocks as old as the Cambrian period. He finds some of the beds contain nearly 10 per cent. of phosphate of lime, which he believes to have been derived from the marine organisms whose remains are found fossilised in these deposits. It is notably to the Cambrian, represented by the large Cambrian trilobites, that he refers the origin of the phosphates; in fact, the remains of trilobites were found to contain as much as 40 or 50 per cent. of phosphate of lime. With the view of comparing this with the percentage of phosphate in living crustaceans, Mr. W. Huddleston has examined the recent lobster. In the exo-skeleton of the lobster, dried at 100° C., he found 3.26 per cent. of phosphoric anhydride; and in the boiled undried lobster, including both soft parts and shell, he detected 0.76 per cent., whence he estimates that a ton of boiled lobsters would contain about 17 lbs. of phosphoric anhydride.

A good deal of discussion has recently taken place among geologists as to the origin of phosphates in sedimentary rocks. Although in many cases it is clear that the phosphates are obtained directly from organic sources, this is by no means a sufficient explanation of their ultimate origin, since it is clear that the earliest organisms must have obtained their supply from inorganic sources. In fact, it appears that the most probable source is to be found in rocks of igneous origin. Most lavas, and other rocks which are undoubtedly eruptive, contain phosphate of lime in the form of apatite, although the proportion of this mineral is generally but small. The wide distribution of phosphates in eruptive rocks was shown many years ago by Prof. Fowkes, and his conclusions have been abundantly corroborated by subsequent researches. By the disintegration of such rocks these phosphates pass into the soil, whence they are taken up by plants, and ultimately pass into the animal economy. On the decay of the animal matter they are returned to the inorganic world, and the cycle of changes is thus completed.—*Athenaeum*.

**EXTRACTION OF METALS FROM THEIR ORES.**—The invention patented by Dr. EMMENS, of Old Jewry, scientific referee, relates to the use of fluor-spar in the roasting process, a solution of salt or saltpetre in the lixiviating process, and iron pyrites in the precipitating process.

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PARIS EXHIBITION, 1867.



VIENNA EXHIBITION, 1873.



LONDON EXHIBITION, 1874.



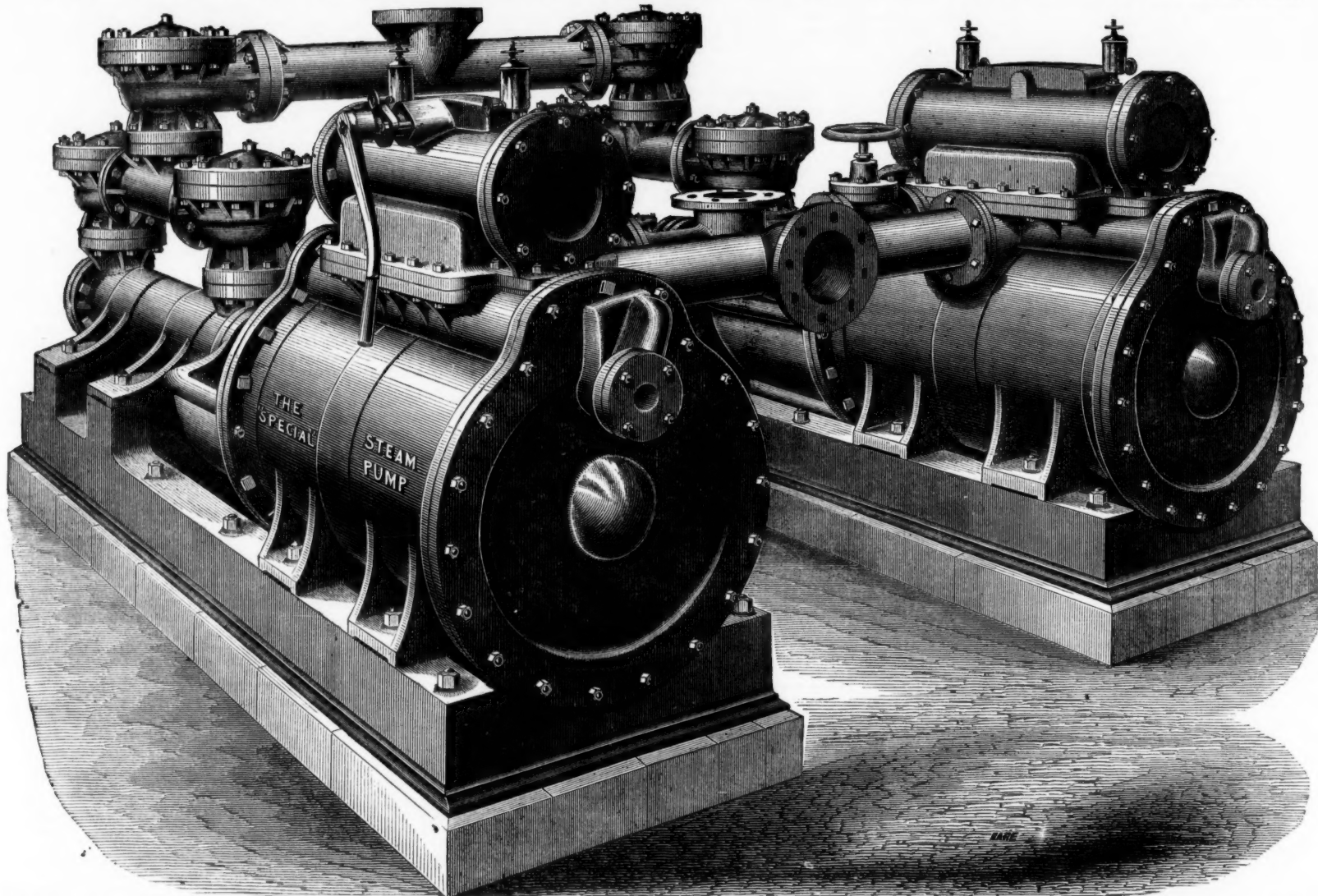
CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

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The following extract from a letter, received by Tangye Brothers and Holman from J. Bigland, Esq., dated Feb. 25, 1875, refers to a "Special" Direct-acting Steam Pumping Engine supplied four years ago to Messrs. Joseph Pease and Partners, for the Adelaide Colliery, Bishop Auckland. The engine is throwing about 8000 gallons per hour, 1040 feet high, in one direct lift:—

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Extract from a letter received by Tangye Brothers and Holman from W. H. Eagland, Esq., dated Feb. 27, 1875, in reference to a "Special" Direct-acting Steam Pumping Engine supplied two years ago to the West Yorkshire Iron and Coal Company near Leeds, to throw 16,000 gallons per hour, 465 feet high, in one direct lift:—

"It is at work night and day. Our man goes down to the pump twice a day (Ten A.M. and Four P.M.), to supply the tallow cups. After this it is left every day till he comes next morning, when he goes down again at Ten A.M. as before. The only repairs the pump has had for 12 months are one bucket, which had worked since we got the pump, and one valve seat, but no valve, so it has cost very little. Its first lift is 70 yards perpendicular, then the water passes up pipes for half a mile, ascending another 70 yards, and then another perpendicular pipe of 15 yards—total, 155 yards vertical height."

Extract from the Official Report of the Commission of the German Empire on the Vienna Exhibition of 1873, treating on Pumping Engines:—

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Ditto of Water Cylinder .....	In.	3	3	3	4	3	4	3	4	5	4	5	6	5	6	7	8	6	7	8	5	6
Length of stroke .....	In.	24	24	24	24	36	24	36	36	36	36	36	36	36	36	36	48	36	36	36	48	36
Gallons per hour approximate .....		1830	1830	1830	3250	1830	3250	1830	3250	5070	3250	5070	7330	3250	5070	7330	9750	5070	7330	9750	13,000	5070
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump		325	425	540	300	665	375	960	540	345	735	470	330	960	615	426	312	775	540	400	300	1058

#### CONTINUED.

Diameter of Steam Cylinder .....	In.	21	21	21	24	24	24	24	26	26	26	26	26	30	30	30	30	30	32	32	32	32
Ditto of Water Cylinder .....	In.	8	9	10	6	7	8	9	7	8	9	10	12	8	9	10	12	14	8	9	10	12
Length of stroke .....	In.	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate .....		13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	9750	13,000	16,519	20,000	30,000	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump		413	326	264	960	700	540	427	345	827	633	500	405	282	840	665	540	375	275	960	758	625

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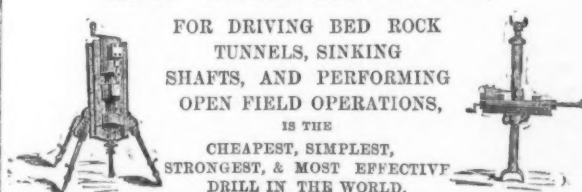
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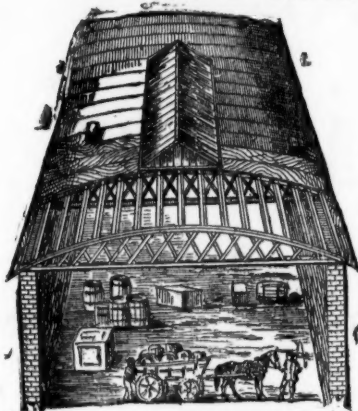
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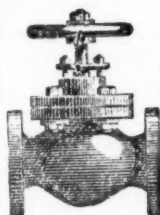
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